

# Pennsylvania Property Assessment: A Self-Evaluation Guide For County Officials

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## Foreword

This guide and attached appendices are the result of cooperation between the Pennsylvania Local Government Commission, a bicameral, bipartisan legislative service agency of the Pennsylvania General Assembly, the County Commissioners Association of Pennsylvania, and the Assessors Association of Pennsylvania through the Property Assessment Reform Task Force formed in January 2017. Comprised of legislators, Commonwealth agency officials, legislative staff, and representation from the aforementioned associations, the Task Force provided legislative, regulatory and best practice solutions to systemic, process-oriented and administrative deficiencies in Pennsylvania's property assessment system. Further information on the initiatives and accomplishments of the Task Force may be found at [www.lgc.state.pa.us](http://www.lgc.state.pa.us).

This document is different from other Task Force work products in that it is neither legislative nor a template from which a county may form other internal assessment-related documents. Instead, this guide is meant to provide its target audience, county commissioners or their equivalent officers, county assessors and other county officials and employees and the public, with a primer on the reasons for periodic review of the status of an assessment system and the broad strokes of how that review may be conducted.

Determining the necessity of a countywide reassessment is not only a highly technical statistical endeavor, but under Pennsylvania law it is an inherently local decision based on multi-faceted local considerations. Consequently this document is not intended to indicate whether a reassessment is appropriate for any county, but is instead more of a survey of the many questions, observations and discussions that must occur prior to reaching such a conclusion. The Task Force was most sensitive to emphasizing the propriety of that local decision-making and reflecting it in the guide.

The Task Force acknowledges the invaluable efforts of the members of the Self-Evaluation Tool Subcommittee in creating this document, and the leadership provided by the Subcommittee's co-chairs, Deb Crawford, Chief Assessor/Tax Claim Director, Tioga County, and Joshua Zeyn, Assistant Chief Assessor, Tioga County.



## **Local Government Commission Property Assessment Reform Task Force**

Senator John H. Eichelberger, Jr., Chairman

Senator John P. Blake

Representative Kate Harper

Representative Mary Jo Daley

Richard "Rick" Vilello

Deputy Secretary for Community Affairs & Development

Pennsylvania Department of Community & Economic Development

Radee Skipworth

Policy Director

Pennsylvania Department of Revenue

Douglas Hill

Executive Director

County Commissioners Association of Pennsylvania

Joan Righter Price, Esq.

Eastburn and Gray

Representing the Assessors' Association of Pennsylvania

Charles "J.R." Hardester, CPE, MS, Chief Assessor

Lawrence County

Representing the Assessors' Association of Pennsylvania

Renee Reynolds, Director

State Tax Equalization Board

Pennsylvania Department of Community & Economic Development

Maryann Nardone, Ph.D.

Philip Klotz, Executive Director

David Greene, Esq., Assistant Director-Legal Counsel

Danette H. Magee, Research Associate

Karen Bear, Secretary

Local Government Commission

## **Self-Evaluation Guide Subcommittee**

Deb Crawford, CPE, PQMC, Co-Chair, Chief Assessor/Tax Claim Director  
Tioga County

Joshua Zeyn, CPE, Co-Chair, Assistant Chief Assessor  
Tioga County

Joan Righter Price, Esq.  
Eastburn and Gray, and Assessors' Association of Pennsylvania Solicitor

Danette H. Magee, Research Associate  
Local Government Commission

Maryann Nardone, Ph.D.

Douglas Hill, Executive Director  
County Commissioners Association of Pennsylvania

Renee Reynolds, Director, State Tax Equalization Board  
Pennsylvania Department of Community and Economic Development

Charles "J.R." Hardester, CPE, MS, Chief Assessor  
Lawrence County

Angie Tennis, CPE, Chief Assessor/Tax Claim Director  
McKean County

Mark Kellerman, CPE, Chief Assessor  
Centre County

Larry Shubert, CPE, Supervisor-Office of Property Assessment  
Philadelphia County

Randy Waggoner, CPE, Chief Assessor  
Perry County

Deidre Hennon, CPE, Acting Chief Assessment Officer  
Allegheny County

Robert Roland, CPE, Clean & Green Administrator  
Bedford County

Linda Kytte, CPE, Head Field Assessor  
Monroe County

Lisa Schaeffer, Director of Government Relations  
County Commissioners Association of Pennsylvania

Denyel O'Brien, CPE, Assessment Systems Coordinator  
Westmoreland County

Kendall Phillips, CPE, Assistant Manager of Property Valuation  
Allegheny County

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# **Pennsylvania Property Assessment:**

## **A Self-Evaluation Guide for County Officials**

*A discussion of the purpose, process and features for advancing fair and accurate property assessments*

### **The Purpose of Assessment Self-Evaluation**

Self-Evaluation of the status and accuracy of assessments will help the county governing body<sup>1</sup> determine if it is meeting state constitutional requirements for fairness and equity by ensuring taxpayers only pay their fair proportion of property taxes. This guide<sup>2</sup> will provide information about such requirements and identify key trends and factors that may affect the fairness, equity and accuracy of real property values in the county and influence the need for a countywide reassessment.

This guide also discusses steps that the county governing body may wish to take to obtain additional information concerning these trends and factors, the readiness of the county to conduct a countywide reassessment, and ways to support the county's property valuation and assessment office efforts to assure fair and equitable assessments.

Pennsylvania counties vary greatly in ways that can influence changes in their property values (e.g., populations, property types, home values, property market stability, economies, predominant industries, and household incomes).<sup>3</sup> County governing body determinations about the need for and timing of the revaluation of all properties in the county and the revision of its assessments (i.e., conduct a countywide reassessments), therefore, may differ.

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<sup>1</sup> The county board of commissioners or the body vested with the legislative authority of the county in counties that have adopted a home rule charter or an optional plan.

<sup>2</sup> DISCLAIMER: THIS GUIDE IS MEANT TO BE CONSTRUED IN ITS ENTIRETY. EXTRACTING MATERIAL FROM ONE SECTION OR APPENDIX OUT OF CONTEXT WITH THE REMAINDER OF THE DOCUMENT IS DISCOURAGED AND COULD BE MISLEADING.

<sup>3</sup> For additional information, see *Pennsylvania's System for Property Valuation and Reassessment*, Legislative Budget and Finance Committee, July 2010, pp. 18-38.

## **Pennsylvania Property Valuation and Assessment Context: The Mandate of Uniformity<sup>4</sup>**

The Pennsylvania Constitution as interpreted by the courts provides the primary and most important standards for use when considering the fairness and equity of real property values in a county. Such standards include the requirement that all real estate in the county be treated as a single class for purposes of taxation and a taxpayer is only required to pay his/her proportionate share of the tax burden as measured by the value of his/her property to that of his/her neighbor. A taxpayer may seek relief from the courts when his/her property is assessed at a higher percent of fair market value than others. Assurance of constitutional uniformity, moreover, requires the same standards are used to provide for fair and equitable assessments, and applied at the same time to all properties in the county. The courts also recognize that property assessment is not an exact science, and rough uniformity with a limited amount of variation is allowed.

The Pennsylvania Constitution's fundamental relevant provision is Article VIII, Section 1, which provides:

All taxes shall be uniform, upon the same class of subjects, within the territorial limits of the authority levying the tax, and shall be levied and collected under general laws.

The courts have issued decisions in several important cases setting forth its understanding of the Pennsylvania Constitution's provision.

- The Pennsylvania Supreme Court ruled in 1909 that all real estate is one class for purposes of taxation under the Uniformity Clause of the Pennsylvania Constitution. Although all real estate is to be valued, assessed and taxed at its actual value, this requirement is subordinate to the requirement of uniformity. The principal of a uniform assessment is that a taxpayer should pay no more or less than their proportionate share of government (e.g., schools, emergency service protection, streets, libraries, and other public benefits).<sup>5</sup> An often-quoted phrase from the court's decision in that 1909 case explains the crux of this issue:

While every tax is a burden, it is more cheerfully borne when the citizen feels that he is only required to bear his proportionate share of that burden measured by the value of his property to that of his neighbor. This is not an idle thought in the mind of the taxpayer, nor is it a mere speculative theory advocated by learned writers on the subject; but it is a

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<sup>4</sup> Appendix A provides more detailed information on important cases that influence real property valuation and assessment in Pennsylvania as of 2018. The county governing body may wish to become more familiar with these landmark decisions and review their implications for the county through consultation with its solicitor and the county chief assessor.

<sup>5</sup> *Delaware, Lackawanna & Western Railroad Company's Tax Assessment (No. 1)*, 73 A. 429 (Pa. 1909); *Clifton v. Allegheny County*, 969 A.2d 1197 (Pa. 2009).

fundamental principle written into the Constitutions and statutes of almost every state in this country.

- In 2006, the Pennsylvania Supreme Court reiterated this long-standing principle stating: “a taxpayer is entitled to relief under the Uniformity Clause where his property is assessed at a higher percentage of fair market value than other properties throughout the taxing district.”<sup>6</sup> The Court also noted that at its core, the Uniformity Clause requires that it be given priority over any competing directives.
- Pennsylvania courts have also issued opinions that influence the manner in which countywide reassessments may be performed. Based on such opinions, all properties must be evaluated using the same set of standards and all properties in the County must be reassessed at the same time. It is also a violation of the Uniformity Clause for properties to be treated differently by any governmental entity based on classifications of property type.
- The courts have recognized that property taxation is not an exact science, but rough uniformity is required<sup>7</sup> and must be the primary goal of assessors. A Supreme Court decision in 1911 said it best:

Common sense and practical everyday business experience are the best guides for those entrusted with the administration of tax laws. Taxation is a practical, and not a scientific, problem.<sup>8</sup>

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<sup>6</sup> *Downingtown Area Sch. Dist. v. Chester Cty. Bd. of Assessment Appeals*, 590 Pa. 459, 466, 913 A.2d 194, 199 (2006), citing *In re Harleigh Realty Co.*, 299 Pa. 385, 388, 149 A. 653, 654 (1930).

<sup>7</sup> “Some practical inequalities are obviously anticipated, and so long as the taxing scheme does not impose substantially unequal tax burdens, rough uniformity with a limited amount of variation is permitted.” *Clifton v. Allegheny Cty.*, 600 Pa. 662, 685, 969 A.2d 1197, 1210–11 (2009) (citing *Beattie v. Allegheny County*, 589 Pa. 113, 907 A.2d 519, 530 (2006)).

<sup>8</sup> *Philadelphia & R. Coal & Iron Co. v. Northumberland Cty. Comm'rs.*, 229 Pa. 460, 471, 79 A. 109, 112 (1911).

## The Role of the County in Property Valuation and Assessment

**The Assessment Office.** The valuation and assessment of real property is one of the most important duties of county government in the Commonwealth. In Pennsylvania, counties are responsible under the pertinent assessment laws to value and assess all properties in a uniform manner. Unlike other states, Pennsylvania does not have a state oversight agency with a direct role in property valuation and assessment or with responsibility for supervision of counties as they perform this important duty. The county chief assessor<sup>9</sup> is responsible by law for supervising the assessment office and the valuations of property subject to or exempt from local real estate taxation. The chief assessor plays a key role in the county by providing technical expertise, experience and knowledge to the assessment office staff, county governing body, and board of appeals, if applicable.

**Market Value and Percent of Assessed Value.** Each county chooses whether to value real property based on current market value (i.e., based on today's dollar value) or on a base year (i.e., the value of the dollar/property at the time the county last revalued all real property in the county). The county also selects the percentage of market value at which property will be assessed. The percentage of market value, referred to as the established predetermined ratio (EPR), is adopted by ordinance by the county governing body and may theoretically range from 1 percent to 100 percent of actual value. All property in the county must be valued using the same market year, i.e., current market or base year, and at the same percentage of market value.

**Frequency.** Each county governing body has the discretion under the applicable assessment laws to determine when and how often it will revalue all properties and establish revised assessments, i.e., conduct a countywide reassessment. Although the decision to conduct and implement a countywide reassessment lies with the county governing body, uniformity challenges through the appeal process can lead to a court order for a county to complete a countywide reassessment. This can occur whether or not the county has planned or is prepared to do a countywide reassessment. (See pages 2-3 and Appendix A (Pennsylvania Constitutional Requirement for Uniformity).)

**Market Value Changes.** The market value of each property in the county may change over time due to certain trends and factors (discussed below). Although substantial changes in these trends and factors result in change in market value among properties in the county, the tax assessments remain static despite such changes unless a county undertakes a countywide reassessment. (See examples in Appendix C (An Overview of Sales Ratio Studies).) The Constitutional imperative of uniformity, coupled with an almost inevitable change in market value of at least some properties, means that it becomes necessary for the county to periodically examine and evaluate properties in order to ensure that the burden of taxation is properly distributed and no one is paying more or less than his/her fair share of taxes. (See Appendix D (Steps in Conducting a Ratio Study and Appendix E (Ratio Study Standards).)

[The county governing body may wish to regularly review information with the chief assessor about trends and factors that may influence change in the market values of real property in the county to assess the need for a countywide reassessment.]

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<sup>9</sup> Some counties appoint a Director of Assessment or Chief Assessment Officer.

## Trends and Factors that May Influence the Need for a Countywide Reassessment

The value of one property relative to that of its neighbor may change based on national, regional and neighborhood trends and factors. Routine review and monitoring of specific data can aide the county in determining if such trends and factors are changing the relative property values in the county, the extent to which such changes may be occurring, and if such changes are disproportionately shifting the tax burden among taxpayers within the county. Appeal volume and concentration may also serve as indicators of possible shifts in property values. Other variables may also contribute to a need for a countywide reassessment.

**Trends and Factors.** National, regional, or neighborhood trends may disrupt the equity and accuracy of real property values.<sup>10</sup> Several different types of trends over time can result in changes in property values and disproportionally shift the tax burden among the taxpayers within the county, including changes in relevant physical (environmental) property characteristics, economic fluctuations, governmental considerations, and social trends.

- *Physical (Environmental) characteristics*, of the property such as age, appearance, maintenance level, depreciation, quality of construction, architectural style, workmanship, lot size or acreage, new construction, remodeling, nuisances, hazards, damages, and the characteristics of surrounding properties may influence change in property values. Without regular maintenance and remodeling, a typical property loses its value as it gets older.
- *Economic fluctuations*, such as business cycles, purchasing power, wage levels, employment rates, inflation, recession, housing shortages/surpluses, tenant mix, rent concessions, lease terms, construction costs for materials and labor, and interest mortgage rates, can also influence property values.
- *Social trends*, such as population characteristics and shifts, crime, and neighborhood cohesiveness, may influence residential property values, while factors such as neighborhood standard of living, income levels, and attitudes towards spendable income may influence commercial property values. Property market shifts (e.g., gentrification) may also occur in certain areas within a county.<sup>11</sup>
- *Governmental considerations*, including public services, such as schools, police and fire protection, and trash collection, building codes, zoning, easements and covenants, insurance requirements, transportation networks, and taxes may also influence changes in property values. Changes in uses permitted by zoning may substantially increase or decrease the value of property.

Changes in one or more of such factors can change the market values of properties in the county. For example, in 2002, two taxpayers owned identical homes in a large township and

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<sup>10</sup> *Property Assessment Valuation*, 3<sup>rd</sup> ed., International Association of Assessing Officers (IAAO), Kansas City, Mo., June 1, 2010, pp. 73-88.

<sup>11</sup> Gloudemans, R.J., and R.R. Almy, *Fundamentals of Mass Appraisal*, IAAO, Kansas City, Mo., 2011, p. 29; *Property Assessment Valuation*, p. 78; *Standard on Property Tax Policy*, IAAO, Kansas City, Mo., January 2010, Section 4.2.1.

school district. Both homes were assessed in 2002 at \$181,900. Taxpayer A's home is located in a rapidly growing part of the township that includes excellent schools. Taxpayer B's home is located in an older part of the township that includes the less desirable schools. Since the properties were assessed in 2002, taxpayer A's home has increased in value by 60 percent while taxpayer B's home value has not increased in value at all. Nonetheless, both homeowners will continue to pay the same in property taxes to the township, school district and county based on their 2002 assessments, if the county has not revised its property values since 2002.

[The county governing body may wish to discuss with the chief assessor and other appropriate county officers or staff a strategy to regularly monitor the way in which changes in physical (environmental), economic, social and governmental factors may be influencing property values in the county and whether they are disproportionately shifting the burden among county taxpayers. The county governing body and appropriate county officers may wish to coordinate the review of relevant available resources, such as federal economic, income and employment data<sup>12</sup>, including the House Price Index,<sup>13</sup> county planning and assessment office information, available realty data<sup>14</sup> and other secondary sources.<sup>15</sup>]

**Appeals.** The volume of property assessment appeals by property type, (i.e., commercial, residential, agricultural, industrial, etc.) and concentration (i.e., appeals in certain geographic areas or political subdivisions) can be an indicator of property valuation and assessment concerns requiring countywide reassessment to address. A significant number of valuation changes due to appeals have the potential to disrupt assessment uniformity.

[The county governing body may wish to direct the chief assessor to regularly prepare reports on the number of property assessment appeals by property type and concentration, and the outcome of such appeals (e.g., disposition of the appeal, adjustments to county assessed values by property type and location, lost revenue, subsequent litigation) as appeal volume and concentration are an important indicator of possible need for a countywide reassessment. The county governing body may wish to regularly review and discuss such reports with the county chief assessor, board of appeals, if applicable, and county solicitor.]

**Administrative Factors.** Other administrative factors may also influence the accuracy and equity of property values. Such administrative factors may include:

- *Incomplete, Unreliable County Property Records.* Accurate property record data is crucial in formulating equitable assessments. Problems with incomplete, unreliable property records may occur when the county:

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<sup>12</sup> United States Department of Labor, Bureau of Labor Statistics, <https://www.bls.gov/eag/eag.us.htm> (accessed 4/30/2018); United States Census Bureau, <https://www.census.gov/econ/> (accessed 4/30/2018).

<sup>13</sup> Federal Housing Finance Agency, <https://www.fhfa.gov/DataTools/Downloads/pages/house-price-index.aspx> (accessed 4/30/2018).

<sup>14</sup> See, e.g., Pennsylvania State Tax Equalization Board (STEB) reports, Pennsylvania's Multi-Listing Reports (MLS), Zillow (national sales listing database), Korpacz Reports (Korpacz Realty Advisors, Inc.), RealtyRates.com, etc. Additionally, important information can be obtained through consultation with local community advisors familiar with local realty markets and business and economic trends.

<sup>15</sup> Secondary data may be available from the Pennsylvania Department of Community and Economic Development's Governor's Center for Local Government Services, the Pennsylvania Department of Education, and the Pennsylvania Department of Revenue.

- Does not routinely review and update the accuracy of its property records through field reviews (see Appendix I (Data Maintenance)).
- Does not routinely validate sales and analyze sales data to validate assessments (see Appendix B (Sales Verification Form) and Appendix D (Steps in Conducting Ratio Studies)).
- Does not routinely receive and/or process building permits from all municipalities in the county for new constructions, improvements, demolition, and mobile home removal. The absence of information relating to improvements (e.g., such as property owners' failure to secure building permits or report substantial improvements to the county assessment office and/or municipal officials' failure to provide such permits to the county assessment office) may contribute to a nonuniform assessment (see Appendix I (Data Maintenance)).
- Encounters problems with the maintenance of property records due to revised interpretations of assessment practices by the courts, appeal boards and solicitors.<sup>16</sup>
- *Prior Inconsistent and/or Problematic Assessment Practices.* Such practices may have disrupted the accuracy and equity of property values. These may include, for example:
  - Valuing properties using different market years.
  - Conducting selective reassessments.
  - Using defective mass appraisal techniques to assign market values to properties in a countywide reassessment that are not consistent with applicable International Association of Assessing Officers (IAAO) Standards and Uniform Standards of Professional Appraisal Practice.
- *Length of Time between Countywide Reassessments.* Longer intervals of time between a countywide reassessment may result in larger shifts in market values. They may also:
  - Lead to large property tax shifts following a countywide reassessment (see Appendix C (An Overview of Sales Ratio Studies) for examples of uniform and non-uniform assessments and the effect on property tax burdens).
  - Result in greater costs to the county and taxpayers, particularly if the county's assessment data and records systems require substantial reconstruction. When property records and sales data are regularly maintained and reliable, the cost of countywide reassessments is reduced. (See Appendix D (Steps in Conducting a Ratio Study) for the importance of accurate and reliable sales data and Appendix H (Planning and Conducting a Reassessment).)
  - Complicate the development of reliable mass appraisal models for use in a countywide reassessment.<sup>17</sup>

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<sup>16</sup> For example, whether the assessment of certain improvements to a property constitute a spot reassessment.

- *Absence of Routine Data Analysis.*<sup>18</sup> Assessment-sales ratio studies, or ratio studies, are important to consider the extent to which the county's assessments reflect its desired percent of fair market value and the extent to which such ratios are comparable among properties in the county. Ratio studies are a form of applied statistics with conclusions made from property sales samples and then applied to all properties in the county.<sup>19</sup> Such data analysis can help monitor county assessments at the time of the most recent countywide reassessment and changes overtime. (See Appendix C (An Overview Sales Ratio Studies).)

A properly designed ratio study can help analyze the comparability of property assessments relative to market values within a neighborhood or property type, and between neighborhoods and property types. Such diagnostic studies are most useful when the county's property records are complete and reliable, and there are enough valid sales to represent the county's property inventory of both sold and unsold properties.

The IAAO recommends that ratio studies be conducted annually regardless of how often the county conducts a countywide reassessment. This allows for problems to be identified and addressed before they become too serious.<sup>20</sup> Following a countywide reassessment, annual ratio studies allow for monitoring of trends and changes in assessment performance over time. As market trends typically cannot be determined from a single study, comparisons from one study to another should be made to determine how current assessments are performing compared to changes in the real estate market across the county's property inventory.

If the county has not conducted a recent reassessment, a ratio study may be conducted to provide an indication of the current level of assessment, and the comparability of assessments across property types and neighborhoods to determine if problems may exist within the county, and determine whether or not any corrective actions are necessary (i.e., conduct additional follow-up studies, plan for a countywide reassessment, initiate a countywide reassessment).<sup>21</sup> (See Appendix H (Planning and Conducting a Reassessment).)

Due to differences in the characteristics of each county in Pennsylvania, there is not a model ratio study that will serve each county equally well.<sup>22</sup> There will be some variations in the scope, content, time period and depth of the ratio studies depending on the amount of sale data available. Applied statistics used in ratio studies require that the sample of sales mirror the makeup of the county's property inventory, be of sufficient number of sales for each property type and neighborhood, and meet other

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<sup>17</sup> See *Pennsylvania's System for Property Valuation and Reassessment*, p. 52 ("Residential mass appraisal models rely on 'snapshots' of sales data to develop assessed values for residential properties. The picture emerging from such snapshots will differ depending upon the period of time in which the model sales occur.").

<sup>18</sup> See Appendix D (Steps in Conducting a Ratio Study) and Appendix E (Ratio Study Standards).)

<sup>19</sup> See *Standard on Ratio Studies*, IAAO, Kansas City, Mo., April 2013, Section 3.2.2.

<sup>20</sup> *Id.* at Section 4.2.

<sup>21</sup> See *Property Assessment Valuation*, pp. 431-443.

<sup>22</sup> See *Standard on Ratio Studies*, Section 3.2.1.



requirements to have confidence in the results. Appendices C (An Overview of Sales Ratio Studies) and D (Steps to Conducting a Ratio Study) provide additional information about ratio studies, their statistical requirements, and how they may be conducted. Appendix E (Ratio Study Standards) provides certain specific assessment performance measures suggested by the IAAO. These standards should not be applied blindly without a thorough review of a county's individual characteristics. Each county, however, should consider adopting specific performance monitoring standards to allow for its own performance monitoring. The standards that are adopted may vary by county, across counties, depending upon each county's property market and inventory, size, and data availability.

[The county governing body may wish to identify and address possible administrative factors that may influence the fairness and equity of county property assessments. The county chief assessor may be best able to describe possible issues with the county's property inventory and assessment practices and provide the county governing body suggestions for addressing such concerns. The county governing body may also wish to authorize the county assessment office to determine if the county is positioned to conduct diagnostic ratio studies and whether such studies should be initiated by county staff or outside resources (e.g., university, independent third party or the State Tax Equalization Board). The county governing body may also wish to support efforts of the county assessment office to prepare staff to complete such data analysis through, for example, participation in available training and webinars. IAAO promotes training and education on ratio studies. The organization offers, for example, a workshop entitled *Fundamentals of Assessment Ratio Studies* that provides an introduction to the development and uses of assessment sales ratio studies based upon the *IAAO Standards on Ratio Studies*. (See <https://www.iaao.org/> and Appendix J (Education and Training).)]

## County Readiness to Conduct a Countywide Reassessment

If the county governing body anticipates or determines the need for a countywide reassessment, adequate and deliberate planning must occur to successfully conduct a reassessment. There are many factors that influence the ability of the county to complete a reassessment, including:

- *Staff.* An adequate number of trained assessment staff resources to perform the assessment function effectively and efficiently.<sup>23</sup>
- *Sales Verification Process.* Current records of valid and invalid sales and sales monitoring (see Appendix B (Pennsylvania Sales Verification Questionnaire and Appendix J (Data Maintenance)).
- *Maps and Deeds.* Accurate tax maps, land value maps, zoning maps, abstracts of deeds (designation of wetlands, flood hazard areas, etc.).
- *Property Data Information.* Such information may include:
  - Current uniform property record system of market and assessed values based on property type, use and neighborhood.
  - Building permits regularly obtained from the municipalities. Assessment office staff should review the building permits and physically inspect the affected properties. The property record inventory should be updated to reflect changes.<sup>24</sup>
  - Land use codes for property type should match the codes used by the Tax Equalization Division (STEB) (see Appendix F (STEB Use Codes and Monthly Sales Export File)).
  - Data relating to claims for tax exemptions, exclusions, abatements, preferential assessments, etc.
- *Technological tools.*<sup>25</sup> These may include:
  - A computer-assisted mass appraisal (CAMA) system. If the county has an existing CAMA system, it should determine if the system will be used to establish values or has the ability to convert existing data to the new CAMA system.
  - A database management system (DBMS), preferably a relational DBMS, which provides integration possibilities with other applications not provided by the base system.
  - A computer system that supports multiyear processing.
  - A computer system with geographic information system (GIS) capabilities.

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<sup>23</sup> *Assessment Practices Self-Evaluation Guide*, 4<sup>th</sup> ed., IAAO, Kansas City, Mo., 2013, p. 6. See also Appendix J (Education and Training).

<sup>24</sup> *Id.* at p. 46.

<sup>25</sup> *Id.* at pp. 21-27.

- A computer system that provides advanced workflow processing and management.
- A computer system that offers the ability to manage document images or photo imagery.
- Data security and integrity, including an audit trail of changes in records that affect assessment.
- Management reports, including ratio reports to monitor some of the factors that may indicate the need for reassessment.
- *County Official Support.* The full support of the county governing body and county administrators is required for successful completion of a countywide reassessment.

[The county governing body may wish to routinely review with the county chief assessor the county's readiness to conduct a countywide reassessment. The governing body may also wish to request the chief assessor prepare a plan to address readiness for a countywide reassessment. **Appendix H** provides additional information for planning to conduct a countywide reassessment.]



# APPENDIX A

## Pennsylvania's Constitutional Requirement for Uniformity

### Constitutional Provision

Article VIII, Section 1 of the Pennsylvania Constitution provides:

All taxes shall be uniform, upon the same class of subjects, within the territorial limits of the authority levying the tax, and shall be levied and collected under general laws.

The Constitutional imperative of uniformity means that it becomes necessary to periodically step back and look at every property in order to ensure that the burden of taxation is properly distributed and no one is paying more or less than their fair share of taxes. Property values change over time. Unless a county undertakes a countywide revision of assessment, the tax assessments remain static regardless of fluctuations in market value resulting from various factors discussed elsewhere in this manual.

### Legal/Decisional Law

The Pennsylvania Supreme Court ruled in 1909 that all real estate is one class for purposes of taxation under the Uniformity Clause of the Pennsylvania Constitution. *Delaware, L. & W. R. Co.'s Tax Assessment*, 224 Pa. 240, 73 A. 429 (1909). Although all real estate is to be valued, assessed and taxed at its actual value, this requirement is subordinate to the requirement of uniformity. An often-quoted phrase from the court's decision in that case explains the crux of this issue

While every tax is a burden, it is more cheerfully borne when the citizen feels that he is only required to bear his proportionate share of that burden measured by the value of his property to that of his neighbor. This is not an idle thought in the mind of the taxpayer, nor is it a mere speculative theory advocated by learned writers on the subject; but it is a fundamental principle written into the Constitutions and statutes of almost every state in this country.

In 2006, the Pennsylvania Supreme Court reiterated this long-standing principle in *Downingtown Area School District v. Chester County Board of Assessment Appeals*, 590 Pa. 459, 913 A.2d 194 (Pa. 2006). The Court stated: "a taxpayer is entitled to relief under the Uniformity Clause where his property is assessed at a higher percentage of fair market value than other properties throughout the taxing district." *Downingtown*, 590 Pa. at 466, 913 A.2d at 199 (citing *In re Harleigh Realty Co.*, 299 Pa. 385, 388, 149 A. 653, 654 (1930)). The *Downingtown* Court also quoted from *Appeal of F.W. Woolworth Co.*, 426 Pa. 583, 235 A.2d 793 (1967), which

recognized that “uniformity has at its heart the equalization of the ratio among all properties in the district” (590 Pa. at 468, 913 A.2d at 200). At its core, the Uniformity Clause requires that it be given priority over any competing directives.

## **Fairness and Equity**

All properties must be evaluated using the same set of standards and all properties in the County must be reassessed at the same time. *City of Lancaster v. County of Lancaster*, 143 Pa. Cmwlth. 476, 495, 599 A.2d 289, 299 (1991). In *City of Lancaster*, the Commonwealth Court stated:

We conclude that, as a matter of law, the County, in singling out ten of the County's taxing districts, in utilizing a different method of assessment on the properties in those districts, and in making unsubstantiated wholesale adjustments to grade and depreciation factors of certain of those properties, violated both the uniformity requirement of Article VIII, Section 1 of the Pennsylvania Constitution and the equalization requirement of 72 P.S. § 5348(d). [Repealed and consolidated into 53 Pa.C.S. § 8801 et seq.]

143 Pa. Cmwlth. at 495, 599 A.2d at 299.

More recently, the Pennsylvania Supreme Court held that it is a violation of the Uniformity Clause for properties to be treated differently by any governmental entity based on classifications of property type. *Valley Forge Towers Apartments N, LP v. Upper Merion Area Sch. District*, 163 A.3d 962, 972–73 (Pa. 2017). It should be noted that residential and commercial properties cannot be treated differently for purposes of assessment and taxation without a specific exception set forth in Pennsylvania’s Constitution.<sup>1</sup>

In the *Valley Forge Towers* decision, the Supreme Court said it has been “an established feature of Pennsylvania uniformity jurisprudence that “all real estate is a constitutionally designated class entitled to uniform treatment and the ratio of assessed value to market value adopted by the taxing authority must be applied equally and uniformly to all real estate within the taxing authority's jurisdiction.”<sup>2</sup> The Court stated more than once their prohibition against any governmental strategy involving disparate treatment of properties using property

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<sup>1</sup> For example, the homestead exclusion.

<sup>2</sup> Quoting *Westinghouse Electric Corp. v. Board of Property Assessment, Appeals & Review of Allegheny County*, 539 Pa. 453, 469, 652 A.2d 1306, 1314 (1995) (citing *McKnight Shopping Ctr., Inc. v. Bd. of Prop. Assessment, Appeals & Review of Allegheny County*, 417 Pa. 234, 209 A.2d 389 (1965)); see also *Clifton v. Allegheny County*, 600 Pa. 662, 969 A.2d 1197 (Pa. 2009).

subclassifications according to property type. The Court underscored the long-standing principle that all real estate is one class in Pennsylvania, entitled to uniform treatment. The Court unanimously held that taxing authorities are not permitted to divide the realty within their taxing district into multiple subclassifications and either apply disparate assessment ratios to the different subclassifications, or otherwise systematically treat them differently. Citing *Clifton*, the Court stated that “where there is a conflict between maximizing revenue and ensuring that the taxing system is implemented in a nondiscriminatory way, the Uniformity Clause requires that the latter goal be given primacy.”

The principal of a uniform assessment is that a taxpayer should pay no more or less than their proportionate share of government (e.g., schools, emergency service protection, streets, libraries, and other public benefits).<sup>3</sup> Although property taxation is not an exact science, rough uniformity is required<sup>4</sup> and must be the primary goal of assessors. A Supreme Court decision in 1911 said it best:

Common sense and practical everyday business experience are the best guides for those entrusted with the administration of tax laws. Taxation is a practical, and not a scientific, problem.<sup>5</sup>

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<sup>3</sup> *Delaware, Lackawanna & Western Railroad Company's Tax Assessment (No. 1)*, 73 A. 429 (Pa. 1909); *Clifton v. Allegheny County*, 969 A.2d 1197 (Pa. 2009).

<sup>4</sup> “Some practical inequalities are obviously anticipated, and so long as the taxing scheme does not impose substantially unequal tax burdens, rough uniformity with a limited amount of variation is permitted.” *Clifton v. Allegheny Cty.*, 600 Pa. 662, 685, 969 A.2d 1197, 1210–11 (2009) (citing *Beattie v. Allegheny County*, 589 Pa. 113, 131, 907 A.2d 519, 530 (2006)).

<sup>5</sup> *Philadelphia & R. Coal & Iron Co. v. Northumberland Cty. Comm'rs*, 229 Pa. 460, 471, 79 A. 109, 112 (1911).





# APPENDIX B<sup>1</sup>

STEB-REQuestionnaire 6/17

## Pennsylvania Real Estate Sales Verification Questionnaire

### For County Assessment Office Use Only: (NOT FOR PUBLIC USE)

Parcel Identification Number \_\_\_\_\_ Assessed Value \_\_\_\_\_ STEB Land Use Code \_\_\_\_\_  
Instrument Number (Book & Page) \_\_\_\_\_ Recording Date \_\_\_\_\_ Sale Price \_\_\_\_\_  
STEB Valid/Reject Code \_\_\_\_\_

#### Seller (Grantor)

Name \_\_\_\_\_  
Mailing \_\_\_\_\_  
City/ST/Zip \_\_\_\_\_

#### Buyer (Grantee)

Name \_\_\_\_\_  
Mailing \_\_\_\_\_  
City/ST/Zip \_\_\_\_\_

Property Description / Lot Size \_\_\_\_\_ Property / Situs Address (No PO BOX) \_\_\_\_\_

### Check any factors that apply to this sale:

#### 1. Special Factors

- ☐ Sale between immediate family members  
Relationship \_\_\_\_\_
- ☐ Sale involved in corporate affiliates belonging to same parent company
- ☐ Auction Sale
- ☐ Deed transfer in lieu of foreclosure or repossession
- ☐ Sale by judicial order (guardian, executor, conservator, administrator, or trustee of an estate)
- ☐ Sale involved a government agency or public utility
- ☐ Buyer (new owner) is a religious, charitable, or benevolent organization, school or educational.
- ☐ Sale of only a partial interest in the real estate
- ☐ Sale involved a trade or exchange of properties
- ☐ Sale of convenience (corrects title; create a joint or common tenancy, etc.)
- ☐ Forced sale or sheriff's sale
- ☐ Land contract or contract for deed
- ☐ Sales of adjoining property
- ☐ NONE OF THE ABOVE

#### 2. Check use of property at the time of the sale:

- ☐ Single Family Residence ☐ Agricultural Land
- ☐ Farm/Ranch with Residence ☐ Vacant Land
- ☐ Condominium Unit ☐ Apartment Bldg.
- ☐ Commercial/Industrial ☐ Other (specify): \_\_\_\_\_
- ☐ Land w/Mineral Rights \_\_\_\_\_

#### 3. Did the sale include an existing business? ☐ Yes ☐ No

4. Was any personal property (such as furniture, equipment, crops, machinery, livestock, business franchise or inventory, etc.) included in the sale price? ☐ Yes ☐ No  
If yes, please describe \_\_\_\_\_

Estimated value of all personal property items included in the sale price \$ \_\_\_\_\_

#### 5. Does property contain a Manufactured Home?

Year \_\_\_\_\_ Model \_\_\_\_\_

#### 6. Any changes in the property since January 1? ☐ Yes ☐ No

☐ Demolition ☐ New Construction ☐ Remodeling ☐ Additions

Date completed \_\_\_\_\_ Cost \$ \_\_\_\_\_

#### 7. Was there a change in use for the property since January 1?

☐ Yes ☐ No

If yes, please describe \_\_\_\_\_

#### 8. Were any delinquent taxes included in the sale price and assumed by the purchaser? ☐ Yes ☐ No

If yes, amount \$ \_\_\_\_\_

#### 9. How was the property marketed? (check all that apply)

- ☐ Listed with agent ☐ Displayed "For Sale" sign
- ☐ Local Advertisement ☐ Offered, "word of mouth"

#### 10. What was the initial asking price? \_\_\_\_\_

#### 11. Days on the market \_\_\_\_\_

#### 12. Method of financing (check all that apply)

- ☐ New loan from Financing Institution ☐ All cash
- ☐ Seller financing ☐ Assumption of existing loan(s)
- ☐ Trade of property: value \$ \_\_\_\_\_ ☐ N/A

#### 13. Total Sale Price \$ \_\_\_\_\_ Closing Date \_\_\_\_\_

#### 14. Was the sale influenced by any unusual circumstances? ☐ Yes ☐ No If yes, please describe \_\_\_\_\_

Print Name \_\_\_\_\_

Signature \_\_\_\_\_

- ☐ Grantor/Seller ☐ Grantee/Buyer
- ☐ Agent ☐ Attorney/Closing Company

**Print Form**

<sup>1</sup> Adapted from *Standard on Verification and Adjustment of Sales*, Appendix A, International Association of Assessing Officers, Kansas City, Mo., November 2010.

STEB-REQuestionnaire 6/17

**Instructions for completing the Real Estate Sales Verification Questionnaire**

**What is the purpose of this form?**

County offices, Pennsylvania's Department of Revenue and the State Tax Equalization Board (STEB) use this form to collect sales data and to determine if a sale can be used in assessment ratio studies. This information is used to compute equalization factors. Equalization factors are used to help achieve a state-wide uniform valuation of properties based on their fair market value.

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- |         |  |
|---------|--|
| ITEM 1  | Please check all boxes which pertain.  |
| ITEM 2  | Check the box which describes the current or most recent use of the property at the time of the sale.<br>Check all boxes which are applicable if the property has multiple uses.   |
| ITEM 3  | Check yes; if the purchase price included an operating business, franchise, trade license, patent, trademark, stock, bonds, technology, and/or goodwill.   |
| ITEM 4  | Check yes; if any tangible and portable items of property were included in the sale price. If possible, provide a brief description and your estimate of value of all personal property included in the sale price.  |
| ITEM 5  | Enter information pertaining to the manufactured home that was conveyed. Can be found on Mobile Home Title or Sales Contract.  |
| ITEM 6  | Check yes; if the property characteristics have been changed since January 1 of the same year of the sale. Indicate what change(s) occurred by marking the appropriate box. Indicate the completion date of the change(s) and the estimated cost of labor and materials.   |
| ITEM 7  | Check yes; if the property's use has changed since January 1 <sup>st</sup> .<br><u>E.g. Residential to Commercial, Agricultural to Commercial/Industrial</u>   |
| ITEM 8  | Check yes; if any delinquent taxes were assumed by the purchaser and included as part of the sale price. Do not consider any prorated taxes for the year in which the property was sold in and are part of normal escrow closing costs.  |
| ITEM 9  | Check all boxes which pertain to the most prevalent method of marketing the property for sale.   |
| ITEM 10 | Enter the initial asking price at the time the property was first marketed for sale.   |
| ITEM 11 | Enter the total number of days the property was listed for sale between the first day on the market to the sale date.  |
| ITEM 12 | Check the predominate method of financing used to acquire the property. Check Trade of property if another property is being traded in lieu of payment and indicate the value of the traded property.<br>Check 'N/A' – Not Applicable if no money exchanged hands or when refinancing of an existing loan.   |
| ITEM 13 | Provide the total sale price and date of sale. The date should be the date of either the deed or the contract for deed was signed, not the date the deed was recorded.   |
| ITEM 14 | Check yes; if there were any facts or unusual circumstances which would cause the sale to be a non-arm's length/non-market value transaction (i.e. buyer/seller did not act prudently, unjust actions, poorly advised, use good judgement in negotiations, under duress, or compelled out of necessity, etc.) or if the buyer owns or controls the property adjoining or adjacent to the property being purchased and describe how the sale was influenced. Use additional paper if necessary. |

## APPENDIX C

### An Overview of Sales Ratio Studies<sup>1</sup>

A ratio study is a comparison of assessed values to valid sale prices; it is a key statistical measure to test and evaluate two major aspects of assessment accuracy: level and uniformity (see Appendix D, “Steps in Conducting a Ratio Study”). The *level of assessment* refers to the overall percentage or ratio of assessed values to market values, as determined by sale prices, at which properties are assessed. *Uniformity* is the degree to which properties or classes (types) of properties are assessed at equitable percentages of market value.<sup>2</sup>

#### Ratio Computations

**Level of Assessment.** The assessment ratio known as the assessment-sale price ratio (ASR) is used as a basis in ratio study statistics. As an example, the calculation of the ASR for a property that is assessed at \$90,000 and sells for \$100,000 is  $\$90,000/\$100,000 = 0.90$  or 90%. After calculating the ASR for valid property sales in a ratio study sample, the level of assessment is computed using statistical measures of central tendency, the most common being the median, mean, and weighted mean. The Common Level Ratio (CLR) calculated by the Pennsylvania State Tax Equalization Board (STEB) is the overall level of assessment calculation for all property in a county. The level of assessment groups or classes of properties in a ratio study will then be used to evaluate assessment uniformity.

**Uniformity.** Ratio studies also measure the degree to which individual assessments differ from the overall level of assessment within a neighborhood or property type (e.g., residential, commercial), and between neighborhoods and property types.<sup>3</sup> There are several statistical measures of assessment uniformity; the most commonly used measure is the Coefficient of Dispersion (COD). Dispersion statistics such as the COD test the level of variation or horizontal equity and uniformity within a group or class of properties. Other statistics such as the Price Related Differential (PRD) and the Price Related Bias (PRB) test vertical equity, which evaluates the differences or bias in the level of assessment between both high and low value properties within a group or class of properties.

#### Monitoring and Evaluating Assessment Performance

Assurance of constitutional uniformity requires that the same standards are used to provide for fair and equitable assessments, and applied at the same time to all properties in the county

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<sup>1</sup> Technical resources are available that provide detailed information about planning and conducting a ratio study. See, e.g., generally, *Standard on Ratio Studies*, International Association of Assessing Officers (IAAO), Kansas City, Mo., 2013; Gloudemans, R.J., and R.R. Almy, *Fundamentals of Mass Appraisal*, IAAO, Kansas City, Mo., 2011; *Property Assessment Valuation*, 3<sup>rd</sup> ed., IAAO, Kansas City, Mo., 2010; IAAO Workshop 452: *Fundamentals of Assessment Ratio Studies*, IAAO, Kansas City, Missouri, 2009.

<sup>2</sup> See *Fundamentals of Mass Appraisal*, pp. 218-219; *Property Assessment Valuation*, Section 2.2.

<sup>3</sup> See *Property Assessment Valuation*, pp. 431-443.

(see pages 2-3 and Appendix A for further explanation). Below are examples of uniform and non-uniform assessments and the effect on property taxes:

### Example 1: Horizontal Inequity

In addition to considering the uniformity or dispersion within a group or class of properties, it is also important to evaluate the uniformity or horizontal equity between groups or classes of properties. “Horizontal Equity involves a comparison of [assessment] levels between groups of properties defined by property type, location, age, size, or some other attribute.”<sup>4</sup>

In the examples below similar properties from both Neighborhood A and B each sold for \$100,000. However, properties in Neighborhood B have a median level of assessment of 0.80, while properties Neighborhood A have a median level of assessment of 1.00. These differences may indicate that horizontal inequity exists between the two neighborhoods. With the exception of Property B, the effective tax rates in Neighborhood A are substantially higher than Neighborhood B. Despite the fact that property owners in Neighborhood B are paying a lower effective tax rate, the uniformity within Neighborhood B is better than Neighborhood A. The difference in assessment to sales ratios in Neighborhood A is 0.60, while the difference in Neighborhood B is 0.20. (Neighborhood A:  $1.300 - 0.700 = 0.600$ . Neighborhood B:  $0.900 - 0.700 = 0.200$ .)

#### Neighborhood A

	Sale Price	Assessed Value	A/S Ratio	Millage Rate	Taxes	Effective Tax Rate (ASR x millage)
Property A	\$100,000	\$130,000	1.300	0.015	\$1,950	1.95%
Property B	\$100,000	\$70,000	0.700	0.015	\$1,050	1.05%
Property C	\$100,000	\$100,000	1.000	0.015	\$1,500	1.50%

Median Level of Assessment in Neighborhood A = 1.00.

#### Neighborhood B

	Sale Price	Assessed Value	A/S Ratio	Millage Rate	Taxes	Effective Tax Rate (ASR x millage)
Property A	\$100,000	\$80,000	0.800	0.015	\$1,200	1.20%
Property B	\$100,000	\$70,000	0.700	0.015	\$1,050	1.05%
Property C	\$100,000	\$90,000	0.900	0.015	\$1,350	1.35%

Median Level of Assessment Neighborhood: 0.80.

<sup>4</sup> See *Fundamentals of Mass Appraisal*, p. 199.

## Example 2: Vertical Inequity

Measures of vertical inequities analyze the differences in assessments of high-value and low-value properties. “When low-value properties are [assessed] at greater percentages of market value than high-value properties, assessment regressivity is indicated. When low-value properties are appraised at smaller percentages of market value than high-value properties, assessment progressivity is the result.”<sup>5</sup> Consider the following example:

Sale #	Sale Price	Assessed Value	A/S Ratio
1	\$ 55,000	\$ 44,000	0.80
2	\$ 60,000	\$ 45,000	0.75
3	\$ 65,000	\$ 45,500	0.70
4	\$ 70,000	\$ 56,000	0.80
5	\$ 75,000	\$ 56,250	0.75
6	\$ 80,000	\$ 56,000	0.70
7	\$ 85,000	\$ 68,000	0.80
<b>8</b>	<b>\$ 90,000</b>	<b>\$ 58,500</b>	<b>0.65</b>
9	\$ 95,000	\$ 42,750	0.45
10	\$100,000	\$ 50,000	0.50
11	\$105,000	\$ 57,750	0.55
12	\$110,000	\$ 49,500	0.45
13	\$115,000	\$ 57,500	0.50
14	\$120,000	\$ 66,000	0.55
15	\$125,000	\$ 56,250	0.45

Median Sale Price = \$90,000.

Average A/S Ratio Below Median Sale Price= 0.76.

Average A/S Ratio Above Median Sale Price= 0.49.

Median A/S Ratio = 0.65.

In Example 2, the lower value properties are assessed at a greater percentage of current market value than the higher value properties. The median sale price of the 15 sales is \$90,000; the seven properties below the median sale price are assessed at 76% of their current market value, whereas the seven properties above the median are assessed at 49% of their current market value. This trend is known as regressivity, where lower value properties carry a larger tax burden as a percentage of value, than the higher value properties. Property taxes tend to be regressive; however, instances may occur where higher value properties are assessed at a higher percentage of value than lower value properties. Again, this is known as progressivity.

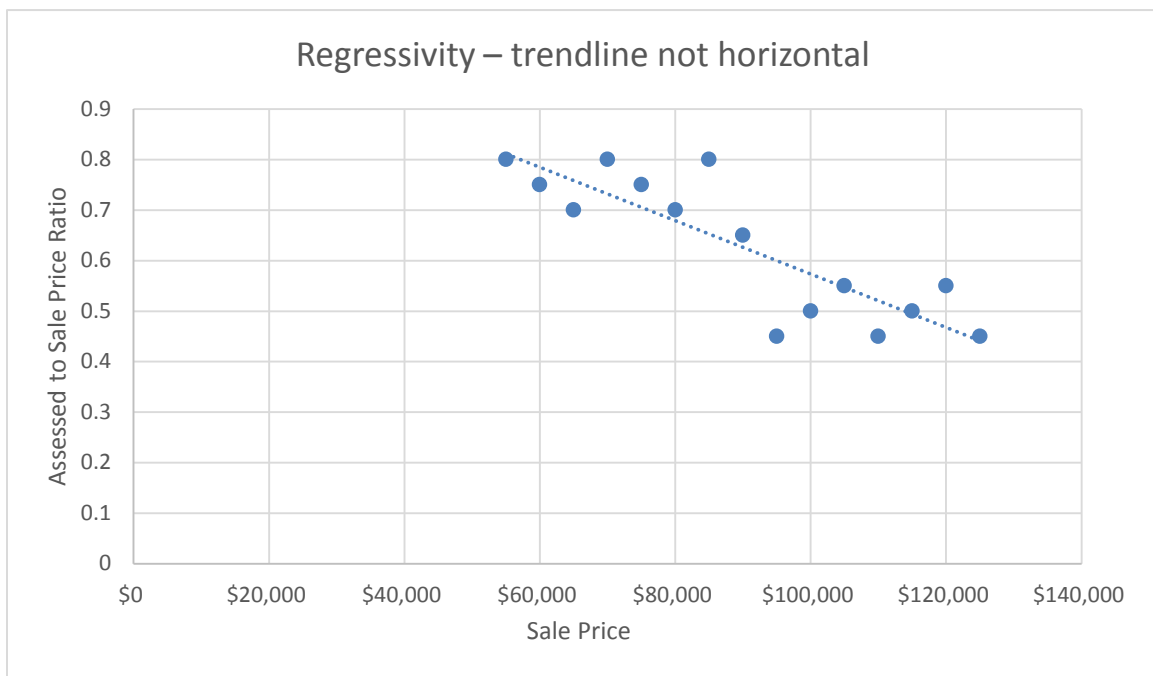
What are the property tax implications as a result of the data listed Example 2? Assuming a tax rate of 15 mills, the owners of the seven properties listed below the median sale price will pay,

<sup>5</sup> See *Standard on Ratio Studies*, Part 1, Section 5.6.

on average, \$794 while the owners of the seven properties above the median sale price will pay, on average, \$814. The difference in tax liability is 2%, but the difference in the market values (sale prices) is 127%.

If the properties listed in Example 2 are assessed at the same median level percentage of market value, the owners of the lower value properties will pay, on average, \$682, and the owners of the higher value properties will pay \$1,048. This is a more equitable distribution of the tax burden given the variation in sale prices.

The chart below provides a visual representation of the regressivity of the assessed values in Example 2. Note the downward trend line as the sale price increases (x axis) and the assessment to sales ratios decreases (y axis). If no bias is present, the sample will produce a horizontal trend line.



## APPENDIX D

### Steps in Conducting a Ratio Study

Ratio studies will vary in detail depending on their purpose, scope, data availability and other considerations. The International Association of Assessing Officers (IAAO) identifies the primary operational steps in conducting a ratio study.<sup>1</sup>

**Appendix D provides an *overview* of these steps. Technical resources are available that provide *detailed* information about planning and conducting a ratio study.<sup>2</sup>**

#### Step 1: Define Purpose, Scope and Objective

During this planning phase, the county assessment office will work with the county governing body and board of assessment appeals, if applicable, to identify the purpose and objectives of the ratio study. The objectives of the study determine its scope, content, depth and required flexibility. For example, the purpose of the ratio study may be to develop baseline statistics prior to conducting a countywide reassessment, or alternatively, conduct an annual ratio study to evaluate and monitor assessment performance over time following a reassessment; both are discussed in more detail below. Objectives may include a list of questions or hypotheses to test during the ratio study. For example, do the ratios currently meet established or desired performance standards? Are residential properties assessed at the same level as other classes of properties? Are newer homes assessed at a higher level than older homes? Counties also might want to investigate problems that come up in certain areas that will need to be addressed during the next reassessment. The scope of the ratio study will vary by county depending on the county's characteristics, the amount and representativeness of available data, and resources that can be allocated to conducting the study. (See *also* page 1 (Purpose of Assessment Self-Evaluation) and Step 2, below.)

A baseline ratio study is conducted if the county has not had a recent reassessment. The purpose of this ratio study is to ascertain the current level of assessment, the comparability of assessments across property types and neighborhoods, problems that may exist within the county, and whether or not any corrective actions are necessary.

In an ideal world, the time period from which valid sales samples are drawn is not more than one year.<sup>3</sup> However, many counties in Pennsylvania may require additional years of sales data due to a lack of valid sales that are representative of the county's property inventory and/or certain strata (e.g., commercial). A maximum of five years of sales data may be used in the ratio

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<sup>1</sup> See *Standard on Ratio Studies*, Part 1, Section 3, International Association of Assessing Officers (IAAO), Kansas City, Missouri, April 2013; Gloudemans, R.J., and R.R. Almy, *Fundamentals of Mass Appraisal*, IAAO, Kansas City, Mo., 2011, pp. 202-212.

<sup>2</sup> See, e.g., generally, *Standard on Ratio Studies*; *Fundamentals of Mass Appraisal*; *Property Assessment Valuation*, 3<sup>rd</sup> ed., IAAO, Kansas City, Mo., 2010; IAAO Workshop 452: *Fundamentals of Assessment Ratio Studies*, IAAO, Kansas City, Mo., 2009.

<sup>3</sup> See *Standard on Ratio Studies*, Part 1, Section 4.4.

study provided “there have been no significant economic shifts or changes to property characteristics.”<sup>4</sup> Older sale prices must be adjusted for time. The data may be analyzed on a countywide basis or stratified by land use codes, property classes, taxing districts and/or neighborhoods. A baseline study may also include a more detailed strata analysis, if necessary, depending upon the amount of data available and the results of the preliminary testing. There are several options available to counties to conduct a baseline ratio study:

- A county assessment office may conduct the analysis using the county’s current CAMA software, spreadsheet software or other statistical package.
- Include the service as part of the county’s annual CAMA software maintenance agreement, or as part of follow-up services after a reassessment.
- Contract with an outside third-party statistical consultant.
- Request Pennsylvania State Tax Equalization Board (STEB) assistance.

An annual ratio study, similar to a baseline ratio study, is conducted to monitor assessment performance after a countywide reassessment. Depending upon county resources and data availability, additional property details may be included in the study, such as construction class, grade, condition, age, value ranges, and stratification by model. Whether the county uses general or detailed stratification in the annual ratio study, the analysis will allow the county assessment office to track assessment performance and identify deficiencies/changes that need to be addressed during the next reassessment. Detailed stratification may require additional information from the county’s CAMA software provider, such as details on the model specification(s) and model(s) used, and calibration methods used, including the mathematical form of the final model(s).<sup>5</sup>

## Step 2: Design

The design of a ratio study will largely depend on the stated purpose, scope, objectives, and data availability. It is critically important in the design phase that attention be given to the quantity and representativeness of valid sales data and resources<sup>6</sup> available to conduct the study. When designing a ratio study, the following factors must be considered.

- Groups or classes of property that will be used in the study.
- Important legal, physical and economic characteristics of the properties in the study.
- The quantity, quality representativeness of the available sales data.
- The values being tested, the sales period being used, and software availability.
- Major operational steps,<sup>7</sup> such as:
  - Data Assembly – Both assessment and sales data (see Step 4 for more discussion about ratio study sampling and trimming).

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<sup>4</sup> See *Standard on Ratio Studies*, Part 1, Section 4.4.

<sup>5</sup> *Uniform Standards of Professional Appraisal Practice* (USPAP), “Standard 6: Mass Appraisal, Reporting,” Rule 6-2 (h), (j), The Appraisal Foundation, 2018-2019.

<sup>6</sup> The resources will vary depending upon whether the county conducts the ratio study in-house or contracts with an independent consultant.

<sup>7</sup> See *Fundamentals of Mass Appraisal*, p. 202.



- Stratification – Level of detail and identification of the strata that will be utilized in the study.
- Statistical and Graphical Analysis - The method by which the study will be conducted (e.g., spreadsheet, statistical package, CAMA system)

Due to differences in the characteristics of each county, there is not a model ratio study that will serve each county equally well; there will be variations in the scope, content, time period, and depth of the studies.<sup>8</sup> The goal is to design the study to be as simply as possible and customized for an intended use. When designing a ratio study for annual performance monitoring following a reassessment, a key element is to design it in a way that it is easily repeatable so that comparisons can be made from one year to the next.

Finally, the IAAO recommends that a ratio study include both statistical analysis as well as visual aids like graphs and charts to display distributions and patterns in the data<sup>9</sup> (see examples under Step 6).

### Step 3: Stratification<sup>10</sup>

Stratification is the division of the properties into similar groups or strata for analysis. The types of strata and the level of detail used will vary depending upon the purpose of the ratio study, the size of the county and the available data. The overall goal of stratification is to identify whether problems exist with assessment levels and uniformity within and among areas or groups of properties; in most cases it will involve the use of multiple characteristics to stratify the data for analysis (see below). For example, residential properties located in a particular neighborhood may be stratified by two characteristics: the type of property and the location.

Primary stratification is a broad, top-down approach that is used to analyze valid sales data for the county as a whole by property classification or STEB Land Use Code (LUCs).<sup>11</sup> Further stratification occurs by major delineations within the county, such as: municipality and school district, neighborhood, geographic or market area<sup>12</sup> (groups of neighborhoods with similar value influences, if already established in the county data set). This type of approach may be used when conducting a baseline ratio study and is similar to the IAAO *Standards on Ratio Studies* for oversight agencies.<sup>13</sup>

Secondary stratification involves a deeper concentration of strata analysis and will vary depending upon the size of the county and availability of valid sales data. This level of stratification may be useful as a part of an annual ratio study to monitor assessment

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<sup>8</sup> See *Standard on Ratio Studies*, Part 1, Section 3.2.1.

<sup>9</sup> *Id.*

<sup>10</sup> *Standard on Ratio Studies*, Part 1, Section 3.3.; see *Fundamentals of Mass Appraisal*, p. 207.

<sup>11</sup> Valid sales data along with STEB LUCs are submitted to STEB on a monthly basis and may require little modification in order to be used in the ratio study.

<sup>12</sup> See *Standard on Ratio Studies*, Part 1, Section 3.4.

<sup>13</sup> See *Standard on Ratio Studies*, “Part 2. Equalization and Performance Monitoring.”

performance after a countywide reassessment. The types of strata that may be examined in an annual ratio study include:<sup>14</sup>

- Type/Subtypes – Residential site built, modular, mobile, etc.
- Size – Building size ranges can be established and studied, for example, dwellings under 2,000 square feet versus dwellings over 2,000 square feet.
- County Land Use Codes – Typically counties have a more detailed land use code list which exceeds the number of LUC's used by STEB.
- Value Ranges – For example, parcels over or under \$200,000.
- Age Groups or Effective Age – Dwellings constructed before or after 1950.
- Grade or Condition – Groups delineated by assessment grade or condition ratings.
- Valuation Model – For example all parcels that are valued using the same valuation model.

## Step 4: Collection and Preparation of Market Data

In a ratio study, sales samples are used to draw conclusions about the entire population of parcels. The reliability of the study requires that the sample of sales are representative of the make-up of the county's property inventory, be of sufficient number of sales for each property type and neighborhood, and meet other requirements to have confidence in the results.<sup>15</sup> The sales data also must reasonably reflect the market value of the property that has been transferred.<sup>16</sup>

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As an example of property inventory representativeness, if residential properties represent 50% percent of the total parcels within a county, then 50% of the sales used in a ratio study should include residential properties. Sales sample size as a percentage of population is also a consideration for calculating the overall level of assessment for all property classes.<sup>17</sup>

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All verified arm's-length (valid sales) transactions should be used in a ratio study, unless their inclusion produces an overrepresentation of particular areas or strata (discussed below).<sup>18</sup> Each sale must be reviewed and, if necessary, adjusted prior to including it in a ratio study (e.g., outliers, duplicate sales).<sup>19</sup> Sale prices also must be representative of the market and not include the value of personal property, leases, nonmarket financing, etc.<sup>20</sup>

The best time to capture sales and assessment data for use in a ratio study is when sales are reviewed by the assessment office staff while preparing the monthly sales export file for

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<sup>14</sup> See *Fundamentals of Mass Appraisal*, p. 207; IAAO Workshop 452: *Fundamentals of Assessment Ratio Studies*, pp. 1-7 – 1-8.

<sup>15</sup> Confidence intervals are one statistical method of testing the reliability of sales samples. See "Tests of Reliability (Precision)" under Step 6 for details about confidence intervals.

<sup>16</sup> See *Standard on Verification and Adjustment of Sales*, IAAO, Kansas City, Mo., November 2010, Section 5.

<sup>17</sup> See *Standard on Ratio Studies*, Part 2, Section 4.2.

<sup>18</sup> Dornfest, Alan, *Idaho Ratio Study Manual, 2017-2018*, p. 9.

<sup>19</sup> When a property sells more than one time during the time period used in a ratio study, only one of the sales should be included. See *Standard on Ratio Studies*, Part 1, Section 4.6.

<sup>20</sup> See *Standard on Verification and Adjustment of Sales*, Section 5.

STEB.<sup>21</sup> It is important for the county assessment office to maintain a separate sales file that captures a “snapshot” of a property’s data when sold so if subsequent changes are made to the property’s characteristics, the sale and assessment possibly can be utilized in a ratio study, if needed.<sup>22</sup> For example, a lot is purchased in an arm’s-length transaction for \$30,000 and is assessed for \$20,000. The following year, the property owner constructs a home on the lot that results in a new total assessment of \$130,000. If the county assessment office ran a report for a ratio study in the year in which the home was constructed, the data would show a sale price of \$30,000 with an assessed value of \$130,000 instead of \$20,000. Maintaining a separate file may allow the county assessment office to merge sales and property characteristic data, if needed for a sales ratio study. Without a separate sales file, the county will have to rereview all of the sales again prior to doing a ratio study.

Sales samples must be adjusted if they are an inadequate in size<sup>23</sup> and/or do not accurately reflect the property inventory. The IAAO suggests remedies to enlarge a small sample size and/or improve the representativeness of the sample in order to improve the reliability of the statistical measures used in the ratio study.

### Enlarging Sample Sizes

- **Restratification.** Under certain conditions,<sup>24</sup> larger sample sizes can be formed by merging existing strata or by stratifying using different delineations. For example, if the sales sample initially is stratified by property class, township, and neighborhood but there are insufficient sales in all of the neighborhoods, the sample can be enlarged by eliminating the neighborhood strata and stratifying by property class and township.
- **Extending Ratio Study Time Period.** As long as the sales are adjusted for time (see time adjustment of sales, below), a period of one to three years may yield a sufficient number of sales. A maximum of five years may be used in certain situations depending upon the stability of the market.<sup>25</sup>
- **Including Previously Invalidated Sales.** Sales will be invalidated for purposes of a ratio study for numerous reasons because they are not representative of the market value of the property. For example, a sale that involves a large amount personal property or was not exposed to the open market for a long enough length of time will be invalidated for ratio study purposes. When the sales sample is too small, the number of sales may be augmented by making adjustments to previously invalidated sales to reflect the market value.
- **Imputing Assessment Performance.** When there are no or few sales for particular strata (e.g., nonresidential property), the missing data potentially may be imputed from the

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<sup>21</sup> See Appendix F; *Standard on Verification and Adjustment of Sales; Sales Validation and Submission Operations Manual*, Pennsylvania State Tax Equalization Board.

<sup>22</sup> See *Assessment Practices Self-Evaluation Guide*, 4<sup>th</sup> ed., IAAO, Kansas City, Mo., 2013, p. 75; *Fundamentals of Mass Appraisal*, p. 82.

<sup>23</sup> A wide confidence interval may indicate an inadequate sample size. See “Tests of Reliability (Precision)” under Step 6 for details about confidence intervals.

<sup>24</sup> For example, the properties are homogenous or have a similar level of assessment.

<sup>25</sup> See *Standard on Ratio Studies*, Part 1, Section 6.4.

data acquired from other similar strata. The approaches to value of the property in the strata must also be similar.<sup>26</sup>

## Improving Representativeness

In some instances, an overrepresentation of sales from a particular area or strata can skew ratio study results. To enhance representativeness, a large sample can be trimmed through further stratification by indiscriminately removing some sales, separating the overrepresented groups into separate strata, and changing the time period from which sales for the overrepresented group are drawn or weighting the data.

As a general rule, sample sizes with fewer than five sales tend to have “exceptionally poor reliability and typically are not very useful.”<sup>27</sup> Sample sizes with 15 or more sales will generally be more reliable.

## Trimming of Outliers

Outliers are ratios “that have unusual values, that is, they differ markedly from a measure of central tendency.”<sup>28</sup> The inclusion of extremely high or low ratios in the data likely will skew the results and jeopardize the validity of the ratio study. When preparing data for a ratio study, outliers should be isolated and reviewed to validate and correct errors. If necessary, the outliers should be trimmed to improve sample representativeness.<sup>29</sup> The typical causes of outlier ratios include:

- Erroneous sale price.
- Nonmarket sale.
- Unusual market variability.
- A mismatch between the property sold and the property assessed.
- An error in the assessment of an individual parcel.
- An error in the assessment of a subgroup of parcels.
- Data entry/collection errors.<sup>30</sup>

(See Appendix G for the IAAO’s Outlier Trimming Guidelines.)

## Time Adjustment of Sales

As discussed under Step 1, a maximum of five years of sales data may be used and adjusted for time for ratio study purposes.

Adjusting sale prices for changes in market conditions, which are reflected by changes in price levels over time, can be an effective way of increasing the

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<sup>26</sup> See *Standard on Ratio Studies*, Part 1, Section 6.4.

<sup>27</sup> *Id.*, Part 1, Section 3.4.

<sup>28</sup> *Glossary for Property Appraisal and Assessment*, 2<sup>nd</sup> ed., IAAO, Kansas City, Mo., 2013, p. 115.

<sup>29</sup> See *Standard on Ratio Studies*, Part 1, Section 5.2.

<sup>30</sup> *Id.*

number of sales available for use...in ratio studies...and increase the accuracy of the analysis.<sup>31</sup>

There are several statistical approaches that can be employed to make time adjustments to sales.<sup>32</sup>

- **Average Unit Value Comparisons.** This method tracks price trends by plotting unit values over a period of time. The selected units should be representative of the property type, for example, the amount of square footage of living area for residential properties, the number of rental units for apartment buildings, or the acreage for rural land. The average unit value comparison can be calculated using the noncompounding rate of change, compounding rate of change, or a regression analysis.

*Noncompounding and Compounding Rate of Change.* The number of months in the period should be on the x axis, and the unit being analyzed on the y axis. By adding a trend or regression line, upward or downward trends can indicate inflation or deflation in value. The change per month can be calculated by dividing the total change in unit value by the number of months between the start and the end months. For example, if the assessor is analyzing changes in the sale price per square foot (sf) of residential properties over a 36 month period with the average price at month 1 of \$90/sf and the average price at month 36 of \$115/sf, the straightline or noncompounding rate of change is calculated as follows.

Average monthly change = (end price – start price) ÷ (months-1).

Rate of change = average monthly change ÷ start price = % change per month.

\$115 - \$90 = \$25/35 months = \$0.714 per month or \$0.714/\$90 = 0.79% per month.

The compounding rate of change is calculated as follows.

Compounding rate = (end price ÷ start price)<sup>1/(months-1)</sup> -1.

$(\$115/\$90)^{1/35} = 1.278^{0.0286} = 1.0070 - 1 = 0.0070$  or 0.70 % per month.

Although the results are different, applying either approach may yield similar time adjusted sale prices in some cases. To further apply the calculations above, assume that the assessor is adjusting a \$175,000 residential sale over the 36 month period. The results would be as follows.

Noncompounding: \$175,000 x (1 + 0.0079 x 35) = \$175,000 x 1.277 = \$223,475.

Compounding: \$175,000 x (1.0070)<sup>35</sup> = \$175,000 x 1.277 = \$223,475.

*Regression Analysis.* Provides a more accurate rate of change over the study period.<sup>33</sup> Using spread sheet software, the linear fit option will provide the necessary equation to convert a regression analysis to either noncompounding or compounding rates of change.

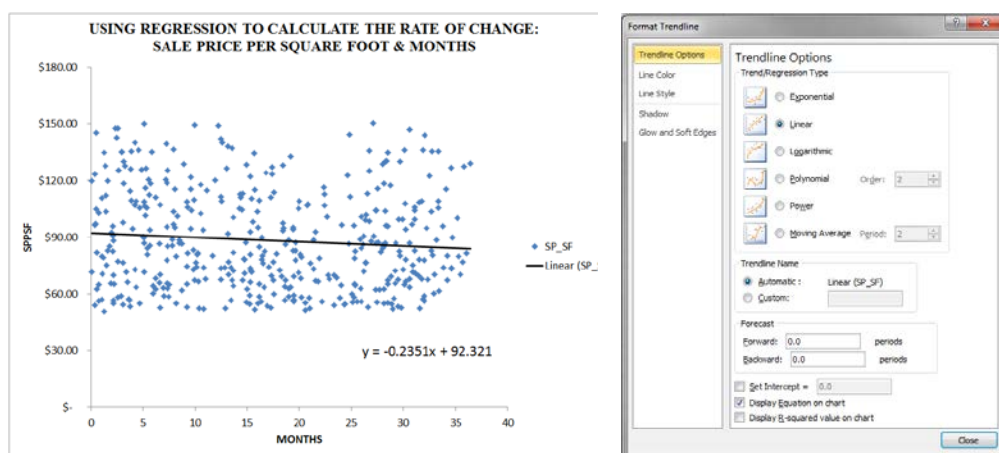
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<sup>31</sup> *Fundamentals of Mass Appraisal*, p. 147.

<sup>32</sup> *Id.*, pp. 148-150.

<sup>33</sup> *Id.*, pp. 150-151.

*Calculation Example:*<sup>34</sup>



Average sales price per square foot (SPPSF) = \$88.35.

Noncompounding rate of change:  $0.2351 \div 92.321 = 0.00254$ , or 0.25% per month.

Compounding rate of change:  $0.2351 \div \$88.35 = 0.00266$ , or 0.27% per month.

The equation indicates that SPPSF changes by \$0.2351 per month. Dividing by the constant (92.321) returns the noncompounding percentage change of 0.25% per month. Dividing by the average SPPSF (\$88.35) returns the compounding percentage change of 0.27% per month.

- Sales Ratio Trend Analysis.** This analysis examines changes in the sale-to-assessment (SAR) ratio<sup>35</sup> to detect upward trends (inflation) and downward trends (deflation). Like unit price comparisons, sale ratio trends may be plotted for visual analysis. The average monthly change may be calculated as a noncompounding (straight-line) or compounding rate of change. For example, if the assessor is studying changes in the SAR of residential properties over a 36 month period, with the average SAR at month 1 of 0.80 and the average SAR at month 36 of 1.20, the straight line or noncompounding rate of change is calculated as follows.

$$1.20 - 0.80 = 0.40/35 = 0.0114 \text{ average monthly change.}$$

$$0.0114/0.80 = 0.0143 \text{ or } 1.43\% \text{ per month.}$$

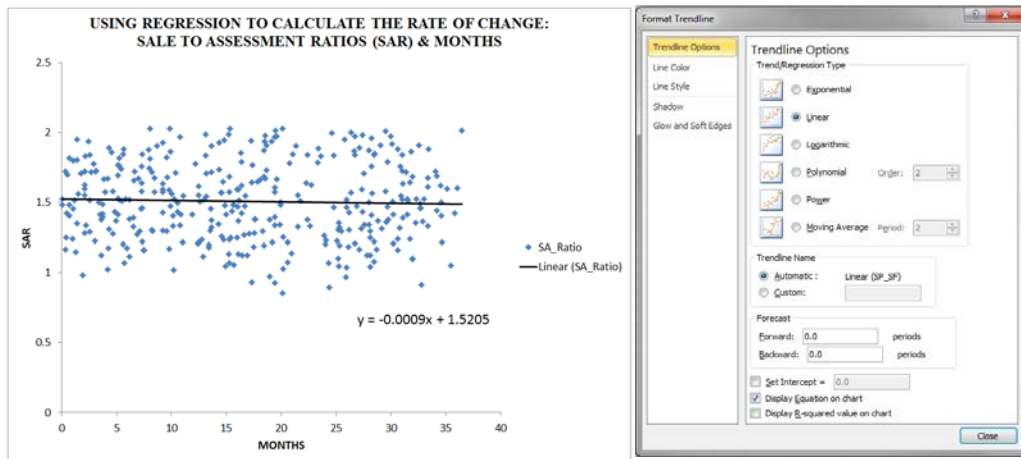
The compounding rate of change is calculated by dividing the average monthly change by the average SAR (calculated separately for all ratios). In this example, assume the average SAR for the sample is 95%.

$$0.0114 / 0.95 \text{ (average of all SAR's)} = 0.012 \text{ or } 1.2\%.$$

<sup>34</sup> See *Mass Appraisal Practices and Procedures*, Workshop 331, IAAO, Kansas City, Mo., 2013, p. 5-28.

<sup>35</sup> As opposed to the assessment-to-sale ratio (ASR).

*Calculation Example:*<sup>36</sup>



Average SAR = 1.505.

Noncompounding rate of change:  $0.0009 \div 1.5205 = 0.00059$ , or 0.06% per month.

Compounding rate of change:  $0.0009 \div 1.505 = 0.00059$ , or 0.06% per month.

The equation indicates that the SAR changes 0.0009 per month. Dividing by the constant (1.5205) returns the noncompounding rate of change of 0.06% per month. Dividing by the average SAR (1.505) returns the compounding rate of change also of 0.06% per month.

- **Resale Analysis.** This method compares sales prices for the same property at unique junctures in time. If there are enough valid resales available and few physical changes have been made to the property between sales, this method can produce time adjustment factors for use in ratio studies. A resale analysis requires accurate data and validation.

After the resales are validated, the percent change per month is calculated for all resales with the median or average of all resales providing an overall rate of change for the ratio study period.<sup>37</sup> For example, the monthly rate of change for a property sold in April of 2015 for \$125,000 and resold 24 months later for \$150,000 is calculated as follows.

$$\$150,000 - \$125,000 = \$25,000 / \$125,000 = 0.20 / 20(24-4) = 0.01 \text{ or } 1.00\% \text{ per month.}$$

<sup>36</sup> See *Mass Appraisal Practices and Procedures*, Workshop 331, p. 5-38.

<sup>37</sup> *Fundamentals of Mass Appraisal*, p. 157.

## Step 5: Matching of Assessment and Market Data

Property data used in a ratio study should have the same physical and legal characteristics as when it was sold. The property descriptions, physical characteristics, rights transferred, and permitted uses should match in order for the sale to be included in the ratio study. As mentioned under Step 4, the best time to capture sales and assessment data for use in a ratio study is when sales are reviewed by the assessment office staff while preparing the monthly sales export file for STEB. (See the discussion under Step 4 regarding the importance of maintaining a separate sales file for purposes of matching assessment and market data.)

## Step 6: Statistical Analysis

After the collection, validation and matching of sales and assessment data have been completed, ratios calculated and outliers<sup>38</sup> accounted for, statistical measures of assessment level, uniformity and reliability<sup>39</sup> may be calculated for the entire county, and for each stratum identified and used in the study. The following list includes the primary statistical measures recommended by the IAAO that may be included or considered for both baseline and annual ratio studies.<sup>40</sup>

### Measures of Central Tendency

Measures of central tendency are used to estimate the level of assessment. The objective of these calculations is to develop one number that best represents the overall level. Germane measures for ratio studies are the median, mean, weighted mean. Each of these measures has advantages and disadvantages, so both should be calculated and compared in a ratio study. “Wide differences among the measures indicate undesirable patterns of appraisal performance.”<sup>41</sup> For purposes a ratio study, the median and Pennsylvania’s CLR (discussed below) should be considered primary measures.

- **Median.** The median commonly the “preferred measure of central tendency”<sup>42</sup> for performance monitoring because it is not overly influenced by outlier ratios. When calculating the median, the data are divided into two equal groups. The median is the midpoint or middle ratio when ratios are arrayed from low to high.<sup>43</sup> The rank of the ratio is found as follows.

Median rank =  $0.5(n) + 0.5$ , where  $n$  = the number of ratios.<sup>44</sup>

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<sup>38</sup> See discussion of trimming outliers in Step 4 and in Appendix G.

<sup>39</sup> See *Standard on Ratio Studies*, Part 1, Section 3.6.

<sup>40</sup> *Id.*, see Part 1, Section 5.4.2 for additional useful statistical measures.

<sup>41</sup> See *Property Assessment Valuation*, p. 439.

<sup>42</sup> See *Standard on Ratio Studies*, Part 1, Section 5.3.1.

<sup>43</sup> The median also serves as the basis from which the Coefficient of Dispersion is calculated.

<sup>44</sup> If the number of ratios is even, the median is calculated as the average of the two middle ratios. See *Property Assessment Valuation*, p. 439.



*Calculation Example:*

Number of Sale	Assessed Value	Sale Price	A/S Ratio	Deviation from Median
1	10,000	18,000	.56	.16
2	9,450	21,000	.45	.05
3	7,200	18,000	.40 (MEDIAN)	.00
4	7,700	22,000	.35	.05
5	18,150	60,500	.30	.10
5 Sales Total	52,500	139,500	2.06	0.36

Median Ratio = Middle Ratio = 0.40 or 40%.

- **Mean (also known as the arithmetic mean or average).** The mean is the average of all of the ratios. This measure is calculated by summing the ratios and then dividing by the number of ratios. Unlike the median, the mean is affected by outliers.<sup>45</sup>

*Calculation Example:*

Number of Sale	Assessed Value	Sale Price	A/S Ratio	Deviation from Median
1	10,000	18,000	.56	0.16
2	9,450	21,000	.45	0.05
3	7,200	18,000	.40	0.00
4	7,700	22,000	.35	0.05
5	18,150	60,500	.30	0.10
5 Sales Total	52,500	139,500	2.06	0.36

Mean Ratio = Sum of Assessment Ratios (2.06) ÷ Number of Sales (5) = 0.412 or 41.2%.

<sup>45</sup> "In a normal distribution the mean equals the median. In a distribution skewed to the right (typical of ratio study data), the mean is greater than the median." *Standard on Ratio Studies*, Part 1, Section 5.3.2.

- **Weighted Mean.** The weighted mean weights each ratio in proportion to its sale price, whereas the median and mean give equal weight to each sale price. This measure is also used in calculating the price-related differential (PRD), and can be used in estimating the total dollar value of a population of parcels from a sample. The weighted mean is calculated as follows:

*Calculation Example:*

Number of Sale	Assessed Value	Sale Price	A/S Ratio	Deviation from Median
1	10,000	18,000	0.56	0.16
2	9,450	21,000	0.45	0.05
3	7,200	18,000	0.40	0.00
4	7,700	22,000	0.35	0.05
5	18,150	60,500	0.30	0.10
5 Sales Total	52,500	139,500	2.06	0.36

Weighted Mean = Sum of Assessments (52,500) ÷ Sum of Sales (139,500) = 0.376 or 37.6%.

- **Common Level Ratio (CLR).** The ratio of assessed value to current market value used generally in the county and published by STEB on or before July 1 of the year prior to the tax year on appeal before the board.<sup>46</sup> The CLR is calculated<sup>47</sup> using every valid sale to compute the mean. The high and low limits are defined using a quartile trimming method, 3.0 X IQR procedure. Only valid sales within the computed limits are used. The resulting arithmetic mean ratio is the CLR, which is certified.

<sup>46</sup> See Title 53 of the Pennsylvania Consolidated Statutes, Section 8802.

<sup>47</sup> STEB will be implementing this new CLR calculation method for 2018 sales that will be certified on or before July 1, 2019.

*Calculation Example:*

Price (\$)	Assessed Value (\$)	Ratio
1,262,017.00	92,600.00	7.34%
146,000.00	55,900.00	38.29%
81,900.00	31,400.00	38.34%
175,000.00	75,400.00	43.09%
27,000.00	12,300.00	45.56%
8,000.00	3,700.00	46.25%
115,000.00	56,500.00	49.13%
3,643,330.00	1,814,800.00	49.81%
70,000.00	35,400.00	50.57%
94,000.00	49,400.00	52.55%
8,500.00	4,500.00	52.94%
110,500.00	60,700.00	54.93%
205,000.00	113,800.00	55.51%
49,900.00	28,300.00	56.71%
139,000.00	79,800.00	57.41%
500,000.00	287,100.00	57.42%
345,000.00	199,900.00	57.94%
149,900.00	87,300.00	58.24%
58,000.00	34,200.00	58.97%
77,000.00	46,400.00	60.26%
335,000.00	202,100.00	60.33%
72,000.00	43,800.00	60.83%
128,500.00	78,300.00	60.93%
132,000.00	80,500.00	60.98%
248,000.00	151,400.00	61.05%
22,000.00	13,500.00	61.36%
155,000.00	95,500.00	61.61%
129,000.00	81,200.00	62.95%
48,000.00	30,800.00	64.17%
205,000.00	132,100.00	64.44%
5,500.00	54,400.00	989.09%
1,000.00	10,000.00	1000.00%
3,500.00	36,400.00	1040.00%
600.00	7,500.00	1250.00%
83,172,401.00	85,262,000.00	96955.80%

<b>Number of Sales</b>	693
<b>Sum Sales Price (\$)</b>	83,172,401
<b>Sum Assessments (\$)</b>	85,262,000
<b>Sum Assessed Ratios</b>	96,955.80
<b>Mean Ratio</b>	139.91
<b>Median Ratio</b>	107.01
<b>Weighted Mean Ratio</b>	102.51
<b>TRIMMING IQR 3.0X</b>	
First Quartile Point	89.89
Third Quartile Point	141.34
Inter Quartile Range	51.45
Lower Trim Point	0.00
Higher Trim Point	295.70
Number of sales trimmed	40
<b>Number of Sales - trimmed</b>	653
<b>Sum Sales Price - trimmed</b>	82,450,455
<b>Sum Assessments - trimmed</b>	82,345,000
<b>Sum Assessed Ratios - trimmed</b>	76,712.59
<b>Mean Ratio – trimmed</b>	117.48*
<b>Median Ratio -trimmed</b>	105.1
<b>Weighted Mean Ratio - trimmed</b>	99.87

\*Certified CLR

## Measures of Uniformity (Horizontal Inequity)

Horizontal equity compares assessment levels “between groups of properties defined by property type, location, age, size, or some other attribute.”<sup>48</sup> The Coefficient of Dispersion (COD) and the Coefficient of Concentration (COC) are two measures of horizontal equity.

- **COD.** The COD measures the average percentage deviation of a group of ratios from the median ratio. This should be used as the primary measure of uniformity.<sup>49</sup> The COD is calculated by dividing the average absolute deviation (AAD) by the median assessment/sale (A/S) and multiplying by 100 to convert the number to a percentage.

$$\text{COD} = 100(\text{AAD}) \div (\text{median A/S})$$

*Calculation Example:*

Number of Sale	Assessed Value	Sale Price	A/S Ratio	Deviation from Median
1	10,000	18,000	0.56	0.16
2	9,450	21,000	0.45	0.05
3	7,200	18,000	0.40 (MEDIAN)	0.00
4	7,700	22,000	0.35	0.05
5	18,150	60,500	0.30	0.10
5 Sales Total	52,500	139,500	2.06	0.36

COD = AAD (0.36 divided by 5 sales) = 0.072 ÷ Median Ratio (0.40) = 0.018 or 18%.

- **COC.**<sup>50</sup> The percent of ratios which lie within an acceptable degree of appraisal error (e.g., 15 percent) of the median. The higher the concentration of ratios around the median, the more likely that assessments are uniform.<sup>51</sup> For example, if 60 percent of the ratios fall within plus or minus 15 percent of the median, then the COC is 60%.

<sup>48</sup> See *Fundamentals of Mass Appraisal*, p. 199. See also the discussion of horizontal equity in Appendix C.

<sup>49</sup> See *Standard on Ratio Studies*, Part 1, Section 5.4.1; *Property Assessment Valuation*, p. 445.

<sup>50</sup> **There are no IAAO standards for this statistic, however it provides for another way to analyze and interpret the ratio study results.**

<sup>51</sup> See *Fundamentals of Mass Appraisal*, p. 225.

*Calculation Example:*

Sale	Assessed Value	Sale Price	Ratio	
1	110,000	233,000	0.472	
2	112,000	226,000	0.496	
3	114,000	219,000	0.521	
4	108,000	200,000	0.540	
5	116,000	212,000	0.547	
6	118,000	205,000	0.576	-15%
7	100,000	150,000	0.667	
8	106,000	158,000	0.671	
9	105,000	155,000	0.677	
10	104,000	152,000	0.684	
11	110,000	160,000	0.688	
12	115,000	165,000	0.697	
13	102,000	146,000	0.699	
14	120,000	170,000	0.706	
15	125,000	175,000	0.714	Median
16	100,000	139,000	0.719	
17	130,000	180,000	0.722	
18	135,000	185,000	0.730	
19	98,000	134,000	0.731	
20	140,000	190,000	0.737	
21	145,000	195,000	0.744	
22	150,000	200,000	0.750	
23	96,000	116,000	0.828	15%
24	155,000	175,000	0.886	
25	160,000	180,000	0.889	
26	165,000	185,000	0.892	
27	94,000	92,000	1.022	
28	92,000	90,000	1.022	
29	170,000	165,000	1.030	
30	90,000	85,000	1.059	

Total Sales:	30
Median: $(0.714 + 0.719)/2$	0.717
Appraisal Error:	15%

Number of Ratios Within 15% of Median	
Ratios Above $(0.717 + 0.15 = 0.867)$	8.000
Ratios Below $(0.717 - 0.15 = 0.567)$	10.000
Total	18.000

Coefficient of Concentration:  $18/30 = 60\%$  or 60

## Measures of Uniformity (Vertical Inequities)

Measures of vertical inequities analyze the differences in assessments of high-value and low-value properties. “When low-value properties are [assessed] at greater percentages of market value than high-value properties, assessment regressivity is indicated. When low-value properties are assessed at smaller percentages of market value than high-value properties, assessment progressivity is the result.”<sup>52</sup> The Price-Related Differential (PRD) and the Price-Related Bias (PRB) are two measures to test vertical equity.

- **PRD.** The PRD is a statistic used to measure vertical equity. A PRD close to 1.00 indicates acceptable equity between high and low-value properties. A PRD considerably greater or lower than 1.0 indicates assessment regressivity and progressivity, respectively. The PRD does have some limitations (e.g., when sample sizes are small or extreme ratios are present); thus the PRD may not be sufficiently reliable in some instances.<sup>53</sup> The PRD is calculated by dividing the mean assessment to sales ratio by a weighted mean ratio (calculated by dividing the sum of the assessed values for all sales by the sum of the sale prices for all sales).

*Calculation Example:*

Number of Sale	Assessed Value	Sale Price	A/S Ratio	Deviation from Median
1	10,000	18,000	.56	.16
2	9,450	21,000	.45	.05
3	7,200	18,000	.40 (MEDIAN)	.00
4	7,700	22,000	.35	.05
5	18,150	60,500	.30	.10
5 Sales Total	52,500	139,500	2.06	.36

PRD = Mean Ratio (41.2) ÷ Weighted Mean (37.6) = 1.095 or 1.10

- **PRB.** The Coefficient of Price-Related Bias is a more contemporary statistic that measures whether assessment to sales ratios are equitable across lower, middle and higher priced properties. More specifically, the PRB “indicates the percentage by which sales ratios fall (or rise) with each doubling (or halving) of property value and thereby

<sup>52</sup> See *Standard on Ratio Studies*, Part 1, Section 5.6.

<sup>53</sup> See *Property Assessment Valuation*, pp. 451-452.

the extent to which regressivity (or progressivity) is present in the ratios.”<sup>54</sup> For example, a PRB of 0.025 indicates that assessment ratios increase by 2.5 percent whenever property values double (indicating that higher value properties are over-assessed relative to low value properties). A PRB of –0.025 indicates that assessment ratios decrease by 2.5 percent when property values double (indicating that high value properties are underassessed relative to low value properties). An advantage of the PRB is that the statistic is less sensitive to outlier ratios than the PRD.<sup>55</sup>

The following table and calculation steps are provided by the IAAO in the *Standard on Ratio Studies*.<sup>56</sup>

**Step 1.** Compute a value proxy, “value,” as 50 percent of sale price + 50 percent of assessed value. To ensure that assessed values and sales prices receive equal weight, assessed values can be divided by the median ratio before summing.

Value = 0.50 × (AV/Median) + 0.50 × SP where:

AV= Assessed Value

SP = Sale Price

Columns (5) and (6) illustrate the calculation. Computing a value proxy based on both assessed values and sales prices minimizes bias inherent in comparing ratios against either assessed values or sales prices alone.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sale	AV	SP	ASR	AV/Med	0.5(3) + 0.5(5) "Value"	Indep Variable Ln(Value)/.693	Dep Variable (ASR – Med)/Med
1	116,700	114,500	1.019	128,267	121,383	16.893	0.120
2	130,300	121,000	1.077	143,215	132,107	17.015	0.184
3	130,200	133,900	0.972	143,105	138,503	17.083	0.069
4	145,500	139,000	1.047	159,921	149,461	17.193	0.151
5	134,100	145,000	0.925	147,392	146,196	17.161	0.016
6	153,900	156,500	0.983	169,154	162,827	17.317	0.081
7	143,400	161,100	0.890	157,613	159,357	17.286	–0.022
8	156,900	169,500	0.926	172,451	170,976	17.387	0.017
9	169,000	175,000	0.966	185,751	180,375	17.464	0.061
10	149,200	181,000	0.824	163,988	172,494	17.400	–0.094
11	160,100	188,900	0.848	175,969	182,434	17.481	–0.068
12	191,400	205,000	0.934	210,371	207,685	17.668	0.026
13	177,200	216,150	0.820	194,763	205,457	17.652	–0.099
14	205,500	219,000	0.938	225,868	222,434	17.767	0.031

<sup>54</sup> Almy, Gloudemans, Jacobs & Denne, *Final Report, Review of Indiana County, Pennsylvania, Reassessment of 2015 for the Indiana County Commissioners*, Phoenix, Az., February 2, 2016.

<sup>55</sup> See *Standard on Ratio Studies*, p. 56; *Idaho Ratio Study Manual 2017-2018*, p. 46.

<sup>56</sup> See pp. 56-58.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sale	AV	SP	ASR	AV/Med	0.5(3) + 0.5(5) "Value"	Indep Variable Ln(Value)/.693	Dep Variable (ASR – Med)/Med
15	206,500	235,000	0.879	226,968	230,984	17.821	-0.034
16	243,800	249,000	0.979	267,965	258,482	17.984	0.076
17	211,600	258,900	0.817	232,573	245,737	17.911	-0.102
18	242,500	263,000	0.922	266,536	264,768	18.018	0.013
19	258,400	305,900	0.845	284,012	294,956	18.174	-0.072
20	265,900	312,500	0.851	292,255	302,378	18.210	-0.065
21	305,700	336,000	0.910	336,000	336,000	18.362	0.000
22	291,600	360,000	0.810	320,502	340,251	18.380	-0.110
23	312,800	399,900	0.782	343,804	371,852	18.508	-0.140
24	352,200	418,500	0.842	387,109	402,805	18.624	-0.075
25	354,900	459,000	0.773	390,077	424,538	18.700	-0.150
Sum	5,209,300	5,923,250	22.578			PRB	-0.120
						Std Error	0.025
	Median	0.910		COD	0.075	t-value	-4.721
	Mean	0.903		PRD	1.027	d.f.	23
	Wtd Mean	0.879		Sales	25	Sig	0.000

**Step 2.** Take the natural logarithm of the value proxy and divide by 0.693:

$$\text{Ln\_Value} = \ln(\text{value})/0.693$$

This is shown in column (7) of the table. Taking logarithms converts the value proxy to a percentage basis, which substantially minimizes the impact of atypically high values (outliers) in the analysis. Dividing by 0.693 allows each increment of 1 to be interpreted as a change of 100 percent. (For example,  $\ln(100,000)/0.693 = 16.613$  and  $\ln(200,000)/0.693 = 17.613$ ).

**Step 3:** Compute percentage differences from the median assessment ratio (column 8 of the table):

$$\text{Pct\_Diff} = (\text{ASR} - \text{Median})/\text{Median} \text{ Where:}$$

$$\text{PCT\_Diff} = \text{Percentage Difference ASR} = \text{Assessment-Sales Ratio}$$

**Step 4:** Regress (3) on (2):

$$\text{Pct\_Diff} = \beta_0 + \beta_1 \times \text{Ln\_Value}$$

“Because each increment of 1 in the independent variable represents a 100 percent change in value, the regression coefficient,  $\beta_1$ , represents the corresponding percentage change in assessment ratios.”<sup>57</sup>

<sup>57</sup> *Standard on Ratio Studies*, p. 57.



## Tests of Reliability (Precision)

The reliability of ratio study results is of utmost importance in a ratio study. “Measures of reliability explicitly take into account the errors inherent in a sampling process.”<sup>58</sup> There are several techniques for evaluating the reliability of a ratio study: confidence intervals, testing the distribution of ratios for normality and hypothesis testing.

- **Confidence Intervals.** Confidence intervals allow testing the degree to which a particular ratio is consistent and stable in measuring what it is intended to measure. The general concept of a confidence interval is that a prediction plus-or-minus some margin of error is going to be reasonably accurate. Reasonably accurate is most commonly defined as 90%, or 95% confidence level. In small or highly variable samples, an 80% confidence level may be necessary. The width of the confidence interval depends on the quantity and variability of data used in the sample. When the data are abundant and homogeneous, the confidence interval will be narrow. If the quantity of data is insufficient or more variable, the confidence interval will be wider.

For example, an analysis of 15 recent property sales in a particular neighborhood yields a mean (average) sale price of \$100,000. The use of a 95% confidence interval yields an interval of \$10,465; resultantly, the low interval will be \$89,535 (\$100,000 – \$10,465) and the high interval will be \$110,465. (100,000 + 10,465). The assessor is 95% confident that the mean (average) sale price in this neighborhood will fall between \$89,535 and \$110,465.

*Example of calculation of the confidence level using Microsoft Excel*

Sale	Price (\$)		
1	60,000	Mean	100,000
2	80,000	Standard Error	4879.500365
3	100,000	Median	100,000
4	110,000	Mode	100,000
5	85,000	Standard Deviation	18898.22365
6	120,000	Sample Variance	357142857.1
7	125,000	Kurtosis	-0.172307692
8	115,000	Skewness	-0.567818935
9	95,000	Range	65,000
10	75,000	Minimum	60,000
11	125,000	Maximum	125,000
12	110,000	Sum	150,0000
13	100,000	Count	15
14	95,000	Confidence Level (95.0%)	10465.48743
15	105,000		
	1,500,000		

<sup>58</sup> See *Standard on Ratio Studies*, Part 1, Section 5.5.

When confidence intervals include the maximum allowable level of assessment, or COD, corrective action might not be necessary.<sup>59</sup> For example, if the acceptable level of assessment range for a rural county is 0.90 – 1.10, and the median level of assessment for residential properties is 0.85, the median 90% confidence interval range of 0.76 – 0.92 would overlap the minimum acceptable level of 0.90.<sup>60</sup>

- **Distribution of Ratio Data (Normality).** When conducting a ratio study, it is important to know whether the ratio data are normally distributed or in the shape of a bell curve. “Performance measures<sup>61</sup> that use the mean or standard deviation can be misleading if the sales sample does not meet the assumption of normality.”<sup>62</sup> The data can be plotted on a histogram to evaluate the distributions of the ratios.<sup>63</sup>

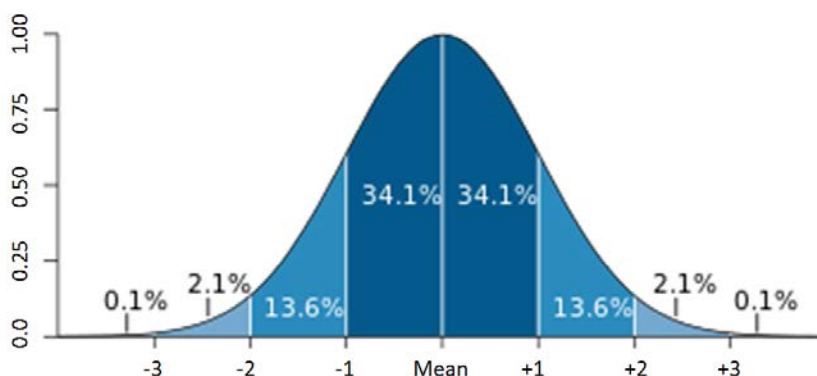
For example, the standard deviation measures dispersion of the ratio data sample around the mean. Assuming a normal distribution, 68% of the values are within 1 standard deviation from the mean, 95% within 2 standard deviations and 99% within 3 standard deviations.

Neighborhood	Standard Deviation	Assessment Level for Indicated Percentage of Parcels		
		68% of parcels	95% of parcels	99% parcels
100	0.100	.85 - 1.05	.75 - 1.15	.65 - 1.25

(Table adapted from *Property Assessment Valuation*, p. 450.)

Mean Level of Assessment: 0.95

Standard Deviation: 0.100



(Graph modified from *Statistics How To!*)<sup>64</sup>

<sup>59</sup> See *Standard on Ratio Studies*, Part 2, Section 6.5.

<sup>60</sup> See *Idaho Ratio Study Manual, 2017-2018*, p. 16.

<sup>61</sup> Coefficient of Variation, Price-Related Differential.

<sup>62</sup> *Id.*, Part 1, Section 5.8.

<sup>63</sup> See *Fundamentals of Mass Appraisal*, pp. 212, 369-374; *Standard on Ratio Studies*, Section 5.9.

<sup>64</sup> <http://www.statisticshowto.com/probability-and-statistics/standard-deviation/> (date accessed 5/30/18).

Meaning that 68.2% of the ratios in the sample will be between 0.85 and 1.05 Standard Deviation 1 (Dark Blue)

And

95% of the ratios will be between 0.70 and 1.15 Standard Deviation 2 (Lighter Blue)

And

99% of the ratios will fall between 0.65 and 1.25. (Lightest Blue)

- **Tests of Hypotheses.** In inferential statistics, a hypothesis is a precise statement or claim that serves as the starting point for statistical testing. The typical process is to make a statement or claim “in the absence of sufficient evidence to the contrary (the statement is called the ‘null hypothesis’), specify the relationship or statement to be proved (termed the ‘alternative hypothesis’), and analyze the available data to determine whether the null hypothesis can be rejected (and hence the alternative hypothesis accepted) at some confidence level.”<sup>65</sup>

A statistical test must be chosen to analyze the hypotheses (or hypothesis): parametric and nonparametric. Parametric tests assume underlying statistical distributions in the data. Nonparametric tests do not rely on any distribution. The IAAO identifies appropriate tests of hypotheses:

Null Hypothesis	Nonparametric Test	Parametric Test
1. Ratios are normally distributed.	Shapiro-Wilk $W$ test D’Agostino-Pearson $K^2$ test Anderson-Darling $A^2$ test Lillifores Test	N/A
2. The level of assessment meets legal requirements.	Binomial test	$t$ -test
3. Two property groups are assessed at equal percentages of market value.	Mann-Whitney test	$t$ -test
4. Three or more property groups are assessed at equal percentages of market value.	Kruskal-Wallis test	Analysis of Variance
5. Low- or high-value properties are assessed at equal percentages of market value.	Spearman Rank test	PRB, correlation or regression analysis
6. Sold and unsold parcels are treated equally.	Mann-Whitney test	$t$ -test

Source: *Standard on Ratio Studies*, Table 1-2, p. 15.

## Data Displays

Data displays (graphs and diagrams) elucidate ratio study data by painting a visual picture of the overall assessment level and uniformity. Data displays may include arrays, frequency distributions, histograms (bar chart), polygons and scatter diagrams,<sup>66</sup> and are useful for

<sup>65</sup> *Glossary for Property Appraisal and Assessment*, 2<sup>nd</sup> ed., IAAO, Kansas City, Mo., 2013, p. 79.

<sup>66</sup> See *Property Assessment Valuation*, pp.432-438; *Fundamentals of Mass Appraisal*, p. 232.

purposes, such as: (1) examining the uniformity of assessments; (2) illustrating the level of assessment for individual municipalities (or classes of property within a municipality); (3) comparing the level of assessment between municipalities or classes of property; (4) interpreting the relationship between the level of assessment and selected property characteristics (e.g., size, grade or sale price); (5) determining the pattern or dispersal of ratios and (6) identifying outliers.<sup>67</sup>

- **Arrays.** Arrays are used in ratio studies to order ratios in a list from lowest to highest ratio. This list is then used to calculate the range, median, and quartiles or percentiles of ratio data. In the table below, the range is 1.655 (2.241 – 0.586). The median is the middle ratio, or the average of the two middle ratios for an even number of ratios; for this example, the median is 0.942 (0.924 + 0.959 = 1.883/2). Quartiles divide the ratio data into four equal parts for analysis. These statistics can provide benchmarks that summarize the distribution of the data and can assist in identifying outlier ratios. Typically arrays are more suitable for smaller samples where direct visual analysis is possible.<sup>68</sup>

Sale Number	Assessed Value(A)	Sale Price (S)	Ratio (A/S)
1	85,000	145,000	0.586
2	85,000	127,000	0.669
3	97,000	115,000	0.843
4	109,000	127,000	0.858
5	145,000	157,000	0.924
6	139,000	145,000	0.959
7	145,000	145,000	1.000
8	115,000	91,000	1.264
9	205,000	145,000	1.414
10	325,000	145,000	2.241

- **Frequency Distributions.** Frequency distributions or relative frequency distributions display the number of ratios or the percentage of ratios that fall within specified intervals and can provide a good indication of assessment performance and uniformity. Frequency distributions are more suitable for large data sets to identify trends or patterns that might be overlooked in an array. A frequency distribution can be created by arraying the ratios, selecting the intervals (or classes) in which to group the ratios, and then counting the number of ratios in each interval.<sup>69</sup> The IAAO identifies general guidelines for constructing a frequency distribution.

<sup>67</sup> See *Property Assessment Valuation*, p. 432.

<sup>68</sup> *Id.*, p. 432.

<sup>69</sup> *Id.*, p. 433.

- ✓ Frequency distributions should have between 5 and 15 intervals and accommodate all the data.
- ✓ Intervals should be equal and *not* overlap.
- ✓ Selecting an equal number of intervals above and below 1.00 provide for a useful point of reference for ad valorem purposes.<sup>70</sup>

Interval	Frequency Distribution – Number of Ratios	Relative Frequency Distribution – Percent of Ratios
<0.500	0.000	0.0%
0.500-0.599	1.000	2.0%
0.600-0.699	2.000	3.9%
0.700-0.799	5.000	9.8%
0.800-0.899	7.000	13.7%
0.900-0.999	12.000	23.5%
1.000-1.099	10.000	19.6%
1.100-1.199	7.000	13.7%
1.200-1.299	4.000	7.8%
1.300-1.399	2.000	3.9%
1.400-1.499	0.000	0.0%
>1.500	1.000	2.0%
Total	51.000	100.0%

In the table above, the interval with the greatest number of ratios (0.900-0.999) represents the most common level of assessment. The distribution of the ratios also provides evidence of the overall uniformity of the assessments. In this example, 70.6% of the ratios fall between 0.800 and 1.199, which is a relatively tight distribution. If the assessment uniformity was poor, a larger number of ratios would fall outside of this range.

The pattern of a frequency distribution is also important. Symmetrical distributions indicate equilibrium between high and low ratios. Nonsymmetrical distributions signal that there is an imbalance between overassessed and underassessed properties.<sup>71</sup>

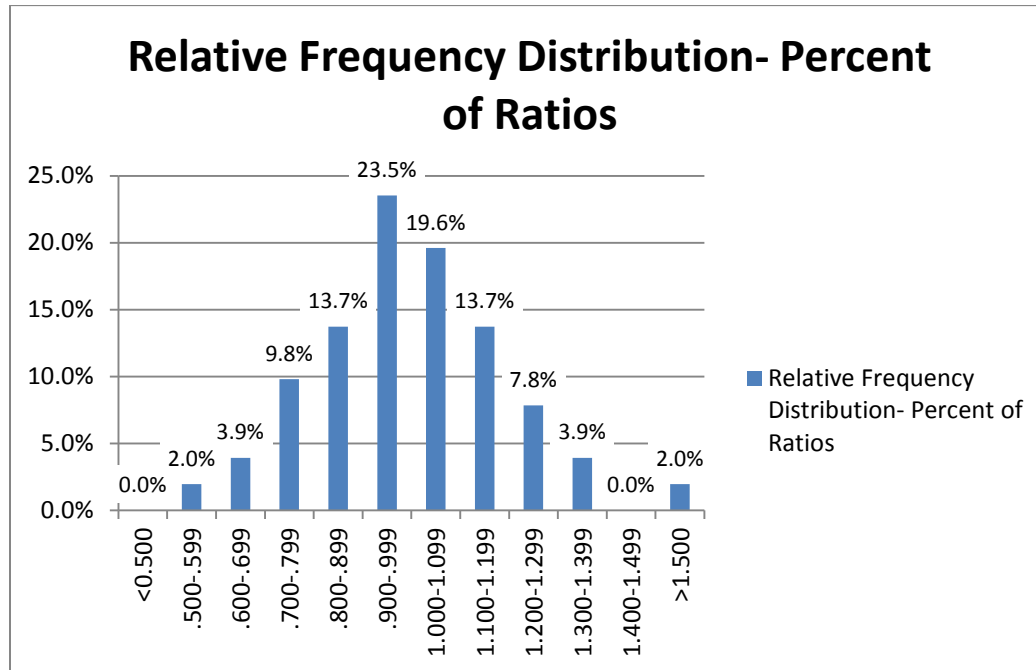
- **Histograms (Bar Charts or Graph).** A bar chart or graph of a frequency distribution in which the frequencies of the various classes are indicated by horizontal or vertical bars whose lengths are proportional to the number or percentage of observations in each class.<sup>72</sup> In the histogram example below, the distribution of the ratios and the assessment accuracy can be analyzed. The highest bar represents the most common level of assessment, and the tightness of the distribution represents the level of

<sup>70</sup> See *Property Assessment Valuation*, p. 433.

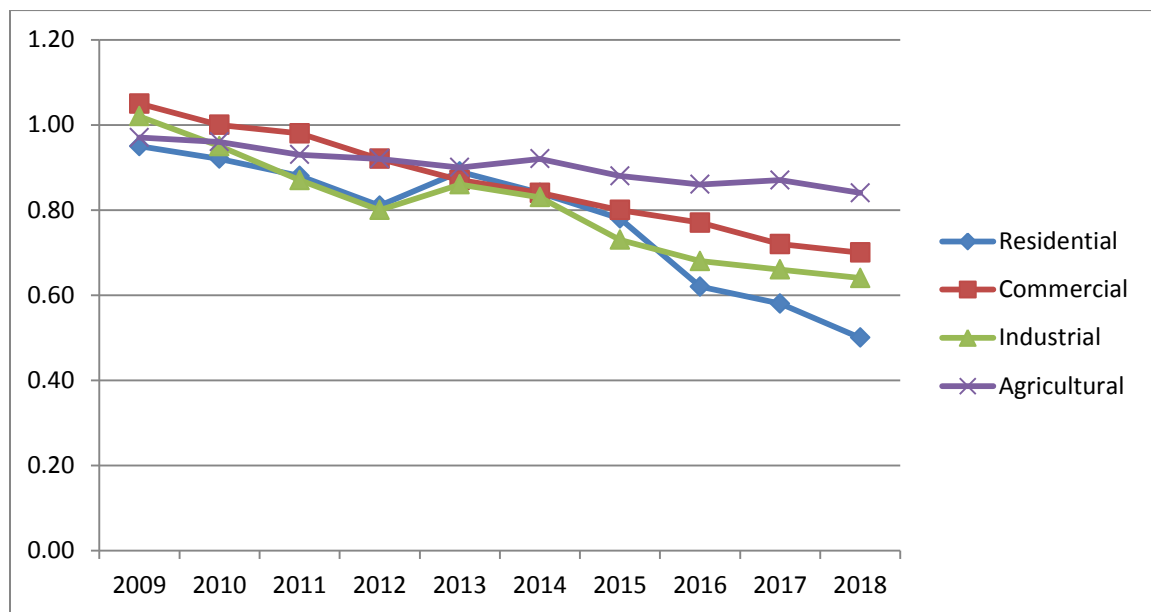
<sup>71</sup> *Id.*

<sup>72</sup> *Glossary for Property Appraisal and Assessment*, p. 78.

uniformity. Tighter distributions are representative of more uniform assessments. The example below could be considered a normal distribution.<sup>73</sup>

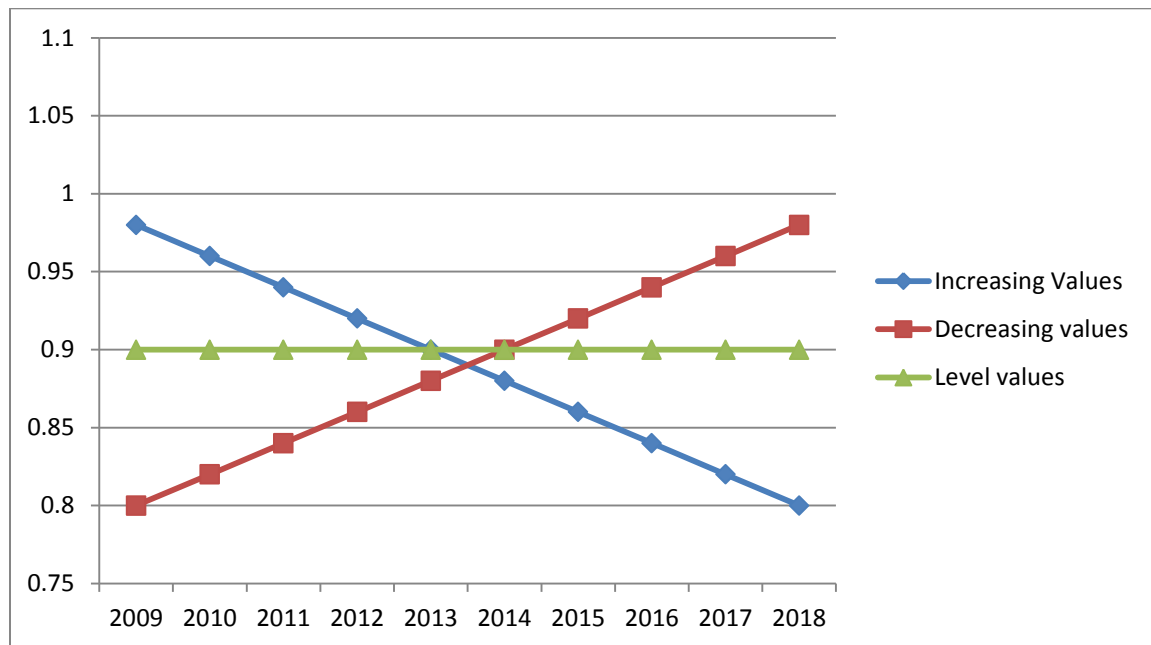


- Polygons (Line Charts).** Polygons and line charts may be used to display multiple data sets on the same graph. Polygons also work well for displaying data that spans a period of time, for instance assessment ratios for each property class over time to track trends in the level of assessment.



<sup>73</sup> See *Property Assessment Valuation*, p. 435, for steps to construct a histogram.

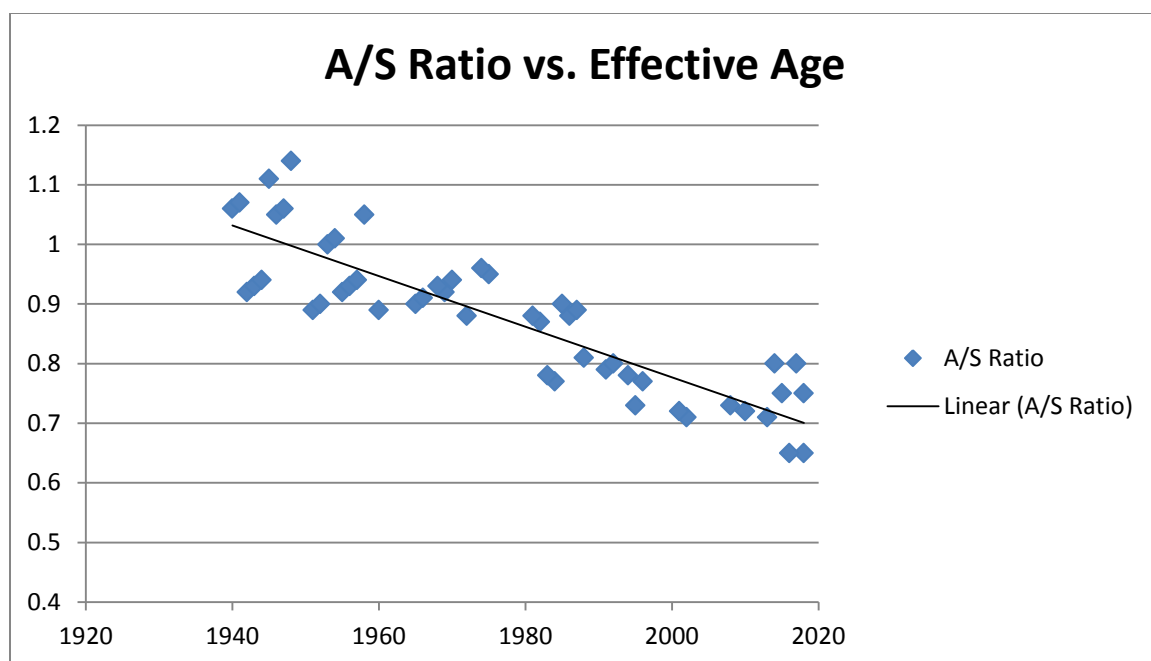
Polygons also allow for price level analysis to track inflation and deflation by examining changes in the overall level of assessment. In the example below, upward trends in the assessment to sales ratio indicate that sales prices are falling and are closer to the assessed values (deflation). Downward trends indicate that sales prices are increasing above the assessed values (inflation).<sup>74</sup>



- Scatter Diagrams.** A scatter diagram is a graph of two variables, independent and dependent. In ratio studies, the assessment to sale ratio or dependent variable is on the (y) axis, and the property characteristic or independent variable such as square feet, sale price or age is on the (x) axis.<sup>75</sup> Any correlation between the two variables is evidenced by the direction of the trend line. In the example below, assessment to sale ratio is plotted against effective age of the properties. As the effective age of the homes increases, the assessment to sale ratio decreases resulting in a negative relationship. This graph depicts that older homes are assessed at a higher percentage of value than newer homes. A horizontal trend line in this example indicates that older and newer homes are equitably assessed.

<sup>74</sup> See *Property Assessment Valuation*, p. 437.

<sup>75</sup> *Id.*, 438.



## Step 7: Evaluation and Use of the Results

As discussed under Step 6, the reliability of a ratio study must be determined prior to any decision-making based on the results of a ratio study. The producer and users of the ratio study must also determine what the ratio statistics indicate about the overall assessment performance.

Ratio studies are a powerful tool to evaluate assessment performance, however there are some limitations. As mentioned previously, applied statistics used in ratio studies require that the sample of sales reflect the make-up of the county's property inventory, be of sufficient number of sales for each property type and neighborhood, and meet other requirements to have confidence in the results. The same is true when ratio study data have been improperly manipulated, e.g., sales chasing or cherry-picking ratios.<sup>76</sup> The results of a ratio study should only be used for the intended purposes for which the study was designed.<sup>77</sup>

Benchmarking the ratios against county standards and/or the IAAO standards provide for acceptable degrees of variation from the overall desired uniformity within a county before corrective action (reassessment) should be considered. Appendix E discusses the IAAO ratio study standards and potential goals for Pennsylvania counties.

"The findings of a ratio study should be sufficiently detailed and documented to meet the needs of the users of the study. Documentation for internal ratio studies can be less detailed than for reports prepared for external uses."<sup>78</sup>

<sup>76</sup> See *Fundamentals of Mass Appraisal*, p. 242.

<sup>77</sup> See *Standard on Ratio Studies*, Part 1, Section 3.7.

<sup>78</sup> *Id.*, Part 1, Section 8.



## APPENDIX E

### Ratio Study Standards

A county undertaking performance monitoring of its assessment system should establish ratio studies standards. As discussed in Appendices C and D, these standards may vary by county depending upon the individual market, size, and data availability. Appendix E includes, among other discussion, technical information from the International Association of Assessing Officers (IAAO) *Standard on Ratio Studies*.<sup>1</sup> As noted by the IAAO, “the objective of the standards is to provide a systematic means for assessing officers to improve and standardize the operation of their offices . . . [the] standards are advisory in nature.”<sup>2</sup> Consequently, these standards should not be applied blindly without a thorough review of a county’s individual characteristics.

Aside from Pennsylvania’s constitutional requirement for taxation uniformity, there are no state statutes or regulations that require specific levels of assessment<sup>3</sup> or a frequency within which countywide reassessments must be conducted.<sup>4</sup> Because desired assessment performance standards may take time to achieve, that is, require more than one reassessment, broader standards may be the initial goal for the county (discussed below), with a longer term objective of achieving the IAAO aspirational standards. If the county has not recently reassessed, then the initial purpose of the ratio study is to provide a baseline evaluation of the county’s assessment level and uniformity.

In counties where there is insufficient data to provide reliable statistics for all of the classes of property, the predominant class may be evaluated and compared to other classes that have adequate data.<sup>5</sup> The Task Force Self-Evaluation Guide Subcommittee reviewed sales and ratio data provided by the Pennsylvania State Tax Equalization Board for six randomly selected counties in Pennsylvania ranging in size from 10,000 to 105,000 parcels. In reviewing the data, none of the six counties met the sample size requirements for all classes of property.<sup>6</sup> Five of the six counties met the sales sample size requirements for the predominant property class as a percentage of the entire county using one year of sales data. The county that did not meet the sales sample size percentage for its predominate class has the second lowest number of parcels

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<sup>1</sup> *Standard on Ratio Studies*, IAAO, Kansas City, Mo., April 2013.

<sup>2</sup> *Id.*, front cover; “Requirements found in the *Uniform Standards of Professional Appraisal Practices* have precedence over technical standards.” *Id.*, front cover.

<sup>3</sup> Pennsylvania courts have ordered several counties to conduct a reassessment over the years. As noted in *Pennsylvania’s System for Property Valuation and Reassessment*, the “courts...have not generally relied on a single factor, but rather the cumulative effect of a variety of relevant factors when deciding to order a county a countywide reassessment.” *Legislative Budget and Finance Committee*, July 2010, p. 99.

<sup>4</sup> Dornfest, Alan, *Review of Calculations of Common Level Ratios (CLRs) in Pennsylvania*, June 6, 2014, p. 25; Almy, Gloudemans, Jacobs & Denne, *Final Report, Review of Indiana County, Pennsylvania, Reassessment of 2015 for the Indiana County Commissioners*, Phoenix, Az., February 2, 2016, p. 5.

<sup>5</sup> Again, real property in Pennsylvania is considered one class for taxation purposes. The classification discussed in this appendix is for purposes of statistical analysis.

<sup>6</sup> Sample size requirements for this review were based on sales sample sizes for each class of property compared to a class’s percentage of the total population of parcels in the county.

of the six counties reviewed, and the predominant class is vacant lots. Although the county still failed to meet the required sample size percentage for its predominate class after including 3 years of data, it did meet the sample requirements for its next two largest classes of property: seasonal and residential properties.

Additional data provided by STEB (Table 1) indicate that the predominant property class for Pennsylvania is residential, which accounts for more than two-thirds (68%) of the parcels statewide. Commercial properties make up 68% of the last third and the rest of the classes make up the remaining 32% difference. The sales data indicate that the majority of sales submitted is residential and make up close to 90%, leaving the remaining classes to make up 10%. This clearly indicates that there will always be a deficiency in the other nonpredominant classes for Pennsylvania, and therefore, there will always be a need to use additional years of sales data. Additional years of data also provide a basis for counties to use and compare the predominant classes of property to evaluate uniformity and decide whether any corrective actions are necessary. Ideally, the IAAO recommends that assessment levels between classes of property not deviate more than 5 percent. (See discussion below about IAAO standards.)

**Table 1**

Property Class as a % of Parcels Statewide		Statewide Sales by Property Class (2017)	
Property Class	%	Number of Sales	%
Residential	68.1%	124,641	89.8%
Manufactured Homes	0.7%	967	0.7%
Seasonal	0.2%	920	0.7%
Lots	1.1%	5,826	4.2%
Industrial	3.1%	407	0.3%
Commercial	22.8%	3,901	2.8%
Agriculture	3.4%	1,848	1.3%
OGM	0.2%	4	0.003%
Land	0.4%	1,382	1.0%
Totals	100.0%	139,896	100.8%

## Coefficient of Dispersion (COD) Standards

Table 2<sup>7</sup> provides an overview of the IAAO’s “acceptable general quality” COD standards that vary by property class, along with STEB’s Land Use Codes (LUCs).<sup>8</sup> The lower the COD expressed as a percentage, the lower the dispersion of ratios around the median ratio, thus indicating better overall uniformity. The county assessment office may wish to review each municipality within the county to determine the applicable property class or group and market activity for each.

<sup>7</sup> *Standard on Ratio Studies*, Table 1-3, p. 17.

<sup>8</sup> The property class “improved agricultural property” and LUC 5000 were added. The STEB LUC 5000 was separated because it does not easily comport with the other property class descriptions in the IAAO table.

Depending upon the level of detail and stratification in the ratio study, this review may also be conducted at the neighborhood level. By identifying property types and market activity, the county assessment office may be able to establish a baseline COD for each property class or group.

**Table 2**

COD standards from IAAO standard on Ratio Studies incorporating STEB LUC's

Property Class	STEB LUC's	Type of property - Specific	COD Range
Single-family residential (including residential condominiums)	1000	Newer homogenous areas/Active Markets	5.0 - 10.0
Single-family residential	1000	Older or more heterogeneous areas, mix of older and newer properties, less active markets	5.0 - 15.0
Other residential	1000, 1100, 1500	Older properties, rural, seasonal, recreational, manufactured housing, 2-4 unit family housing, depressed markets	5.0 - 20.0
Income -producing properties	3000, 4000	Larger areas represented by large samples, newer properties/active markets	5.0 - 15.0
	3000, 4000	Smaller areas represented by smaller samples, older & newer properties/less active markets	5.0 - 20.0
	3000, 4000	Rural or small/older properties/depressed markets	5.0 - 25.0
Vacant Land, Residential Vacant Land	2000, 9800	rapid development/ active markets	5.0 - 15.0
	2000, 9800	slower development/ less active markets	5.0 - 20.0
	2000, 9800	Rural or small/little development/depressed markets	5.0 - 25.0
Other Vacant land	9800	rapid development/ active markets	5.0 - 20.0
	9800	slower development/ less active markets	5.0 - 25.0
	9800, 6000	Rural/little development/depressed markets	5.0 - 30.0
Improved Agricultural	5000	varies with local conditions and market activity	5.0 - 25.0

*IAAO Disclaimer:* These types of property are provided for guidance only and may not represent jurisdictional requirements. Appraisal level for each type of property shown should be between 0.90 and 1.10, unless stricter local standards are required. The Price-Related Differentials (PRD) for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity. PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exists. In such cases, statistical tests of vertical equity hypotheses should be substituted. CODs lower than 5.0 may indicate sales chasing or nonrepresentative samples.<sup>9</sup>

As previously discussed on pages 5-9, many trends and factors can influence market values and impact performance standards. If the county's assessment data is stale (e.g., longer than 10 years since the last reassessment) or inadequate (e.g., lack of sales, inaccurate property records), the county may wish to use a broader COD performance standard for purposes of a baseline ratio study.<sup>10</sup>

As an example, the Table 3 depicts a broader COD standard than that suggested by the IAAO by expanding the COD range for each property class by five points. The IAAO standards are

<sup>9</sup> See fn. 8.

<sup>10</sup> See also *Standard on Ratio Studies*, "Alternative Uniformity Standards," sec. 9.2.8.

aspirational; however, the greater the deviation from the standards, the more likelihood that assessment uniformity is compromised.

**Table 3<sup>11</sup>**

Broader COD standards from IAAO standard on Ratio Studies incorporating STEB LUC's			
Property Class	STEB LUC's	Type of property - Specific	COD Range
Single-family residential (including residential condominiums)	1000,	Newer homogenous areas/Active Markets	5.0 - 15.0
Single-family residential	1000	Older or more heterogeneous areas, mix of older and newer properties, less active markets	5.0 - 20.0
Other residential	1000, 1100, 1500	Older properties, rural, seasonal, recreational, manufactured housing, 2-4 unit family housing, depressed market	5.0 - 25.0
Income -producing properties	3000, 4000	Larger areas represented by large samples, newer properties/active markets	5.0 - 20.0
	3000, 4000	Smaller areas represented by smaller samples, older & newer properties/less active markets	5.0 - 25.0
	3000, 4000	Rural or small/older properties/depressed market areas	5.0 - 30.0
Vacant Land, Residential Vacant Land	2000, 9800	rapid development/ active markets	5.0 - 20.0
	2000, 9800	slower development/ less active markets	5.0 - 25.0
	2000, 9800	Rural or small/little development/depressed markets	5.0 - 30.0
Other Vacant land	9800	rapid development/ active markets	5.0 - 25.0
	9800	slower development/ less active markets	5.0 - 30.0
	9800, 6000	Rural/little development/depressed markets	5.0 - 30.0
Improved Agricultural	5000	Varies with local conditions and market activity	5.0 - 30.0

Counties may wish to consider creating a scale or grading system against which to measure assessment to sales ratios. The breakdowns ("Type of property-Specific" column above) for each class of property take into consideration the size of the study area, composition of the study area, and available sales or market activity. Municipalities and neighborhoods with newer, relatively homogenous properties and adequate sales may be analyzed with more stringent standards than areas with older, less homogenous properties and fewer sales.

*Example of applying a broader COD standard using data from Table 3:*

Single Family Residential, Newer Homogeneous/Active Markets

- COD 5 to 10 : Excellent – Good
- COD 10 to 15: Good – Fair
- COD 15 to 20: Fair – Poor

## Level of Assessment Standards

The IAAO recommends a level of assessment between 0.90 – 1.10. Variations in assessment levels between classes should also be considered; the IAAO recommendation is no more than 5 percent.

<sup>11</sup> IAAO COD table adapted by the Task Force Self-Evaluation Guide Subcommittee.

A broader level of assessment for Pennsylvania counties may be considered, such as 0.80 – 1.20, with assessment level variations between classes no more than 10%.

## Price-Related Differential (PRD) and Price-Related Bias (PRB) Standards<sup>12</sup>

The IAAO recommends a PRD of 0.98-1.03, and a PRB of no more than +0.10 to -0.10 or a 20% range if statistically significant at a 95% confidence level.<sup>13</sup>

## Time Standards

The IAAO recommends no more than 4 to 6 years in between reassessments with annual reassessments affording the maximum accuracy. A broader standard for Pennsylvania in the short term may be no more than 10 years between reassessments,<sup>14</sup> with the goal of moving towards IAAO standards of 4 to 6 years. The Task Force Self-Evaluation Guide Subcommittee recommends that counties adopt 100% Established Predetermined Ratio (EPR) following their next reassessment. This has been a trend in Pennsylvania with the majority of the counties moving towards 100%. In Pennsylvania, a change in the county's EPR is considered a "reassessment" and requires the county to apply the statutory antiwindfall measures and notification procedures. A change in the EPR is not synonymous to a countywide reassessment where *each* parcel is reviewed and valued and will not correct underlying uniformity deficiencies. A change in the EPR likely will impact the amount of taxes paid as demonstrated by the example below.

*Example:*

Sale Price	Assessed Value	EPR 50%	Current Millage 0.01	1 mill increase 0.011
\$ 100,000	\$ 75,000	\$ 37,500	\$ 375.00	\$ 412.50
\$ 100,000	\$ 50,000	\$ 25,000	\$ 250.00	\$ 275.00
		<b>Difference</b>	<b>\$ 125.00</b>	<b>\$ 137.50</b>
Sale Price	Assessed Value	EPR 100%	Current Millage (Equalized for EPR change to 100%) 0.005	1 mill increase 0.006
\$ 100,000	\$ 75,000	\$ 75,000	\$ 375.00	\$ 450.00
\$ 100,000	\$ 50,000	\$ 50,000	\$ 250.00	\$ 300.00
		<b>Difference</b>	<b>\$ 125.00</b>	<b>\$ 150.00</b>

\*A 1 mill increase at 100% EPR results in a greater difference in taxes paid (\$150.00) than at 50% EPR (\$137.50).

<sup>12</sup> See IAAO disclaimer about the PRD below Table 1.

<sup>13</sup> See *Standard on Ratio Studies*, Part 2, Section 9.27; Appendix G (Outlier Trimming Guidelines).

<sup>14</sup> See also Appendix H (Planning and Conducting a Reassessment.)

## **Baseline Study**

Each county may wish to conduct a baseline study within the next 3 years to gauge assessment level and uniformity within the county. STEB may offer assistance to a county with calculating certain performance measure calculations. STEB is charged by law to certify only one performance measure in Pennsylvania, the CLR. *Any assistance by STEB to a county in the form of performance measure computations will be advisory guidance only.*

## APPENDIX F



### State Equalization Board Land Use Codes and Monthly Sales Export File

Code	Land Use Type
1000	Residential
1100	Manufactured Home
1500	Seasonal Housing
2000	Lot (Less than 10 Acres)
3000	Industrial
4000	Commercial
5000	Agriculture (10 Acres or more w/ Building)
6000	Oil/Gas/Mineral
9800	Land (More than 10 Acres)

### PA-TEDtrac UPLOAD DOCUMENT PROCESS

The following document explains the business process which is used for county assessment offices to upload sales data files to the system.

#### **File Document Information**

Counties will use a generic text file document naming convention of county code\_Month\_Day\_Reporting Year.txt; an example: **673514.txt**, County code of 67 and the date of **March 5, 2014**. This naming of the file will be saved to each monthly text file submitted to STEB.

Each transfer entered into the TEDtrac system must contain at least; Parcel ID, County, Municipality, Year, Month, Sale Price, Assessed Value, Land Use Code, and Validation/ Rejection Code.

## Possible Flag Errors

- The file should not contain any trailing spaces, or any carriage returns at the bottom and/or between the records rows, otherwise this will be considered a failed file document and will cause an error to be flagged.
- There is a business rule check which looks at a predefined number of characters (first 50 characters in the string) and makes sure it is a correct sale up to the “P” (Parcel Number), and if any part of the sales string is incorrect an error will flag that entry.
- Parcel numbers must be assigned to each sales record and **MUST** be unique. During an electronic upload if another sales record has a duplicate parcel number, the system will not allow that record to be submitted into the new system and an error will be flagged. Exception: if manual entry is being completed, the system will overwrite the original parcel and the first sale will be lost.
- An error message will be displayed on the screen indicating what row the parcel number and what is wrong with that string. (Example below on page 4)
- There is an Error count max and once 20 errors are reached within an upload, the process will end and an indication to review the entire file before upload can continue.
- If a flag error is generated the entire document and all records in that file will be rejected until fixed.

### The default string details:

Example String													
1021400000671111000099000000000200000000020000312P													

### Using Zero's (preferred method)

1	02	14	000	00	67	1111	0000	99	0000000002	0000000002	00003	12	P{50}
G1	G2	G3	G4 <sup>‡</sup>	G5 <sup>‡</sup>	G6	G7	G8	G9 <sup>‡</sup>	G10	G11	G12	G13	G14

<sup>‡</sup> Indicates current unused locations



Total String Length	100 digits: first 50 digits to and including the P (parcel number) and the following additional 50 digits after	If string is greater than 100, a flag error will be triggered	
G1 (1)	1-digit: default indicator	Must be the numeral 1, if not 1 it will cause a flag error	
G2 (2) Month	2-digit	Must be a valid value for each month's corresponding number from 01 (January) to 12 (December), all other numbers will cause a flag error	
G3 (2) Year	2-digit	Must be a current reporting year for which sales are being submitted, if the sale occurred in the previous year or the wrong reporting year is indicated, the system will not accept it and will cause a flag error	
<b>G4 (3) Page #<sup>‡</sup></b>  *In the past this was used as part of the Deed "Page" details; a county may continue to use this if it conforms to the character spacing criteria.	3-digit: this is a place holder	Currently is not in use. However, the string must contain three numeric values. The suggested values are to use all zeros (000), if the length is missing any of these values it will cause a flag error	
<b>G5 (2) Line #<sup>‡</sup></b>  *In the past this was used as part of the Deed Page "Line" details; a county may continue to use this if it conforms to the character spacing criteria.	2-digit: this is a place holder	Currently is not in use. However, the string must contain two numeric values. The suggested values are to use all zeros (00), if the length is missing any of these values it will cause a flag error	
G6 (2) County Code	2-digit	Must be a valid county number, any invalid code will cause a flag error	
G7 (4) Muni Code	4-digit	Must be a valid municipality code associated with the county's 2-digit County Code. The system will cross-check the codes and must contain four numeric values, if the code is incorrect or if the length is missing any of these values it will cause a flag error	

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G8 (4) Property (Land Use)	4-digit	Must be a valid STEB land use codes. The system will cross-check the codes and must contain four numeric values, if the code is incorrect or if the length is missing any of these values it will cause a flag error. For the list of acceptable land use codes, please refer to the STEB Sales Validation and Submission Operations Manual.
G9 (2) Ward <sup>†</sup>  *In the past this was used as an identifier to which ward within a city; a county may continue to use this if it conforms to the character spacing criteria.	2-digit: place holder	Currently is not in use. However, the string must contain two numeric values. The suggested values are to use all zeros (00), if the length is missing any of these values it will cause a flag error
G10 (10) Sales Price	10-digit	Sale Price must contain only numeric values and be 10-digits in length. Values are to be proceeded with zeros to make the accepted length. No special characters such as dollar sign (\$), comma (,) or decimal point (.) is accepted and if the length is missing any of these values it will cause a flag error
G11 (10) Assessed Values	10-digit	Assessed Values must contain only numeric values and be 10-digits in length. Values are to be proceeded with zeros to make the accepted length. No special characters such as dollar sign (\$), comma (,) or decimal point (.) is accepted and if the length is missing any of these values it will cause a flag error
G12 (5) Ratio A/S	5-digit: place holder	A/S Ratio is a STEB calculated field and contains five numeric values. The suggested values are to use all zeros (00000) however can be left blank. If a value other than the zeros is entered in this string position, the system will not recognize the value and the calculated A/S Ratio will overwrite the value.
G13 (2) Reject Code	2-digit	Must be a valid STEB validation/rejection code. The system will cross-check the codes and must contain two numeric values, if the code is incorrect or if the length is missing any of these values it will cause a flag error. For the list of acceptable validation/rejection codes, please refer to the STEB Sales Validation and Submission Operations Manual.

G14 P{50} Parcel ID	1-digit: Must be the letter <b>P</b> plus an additional 50 characters	This is a mandatory field. It must contain the letter <b>P</b> followed by the parcel number and may contain any type of characters in this string. This parcel number will be used to identify sales records in the system and must be unique. Any records containing two or more of the same parcel numbers will cause a flag error. If the parcel transfers more than one time in the reporting year, the Parcel ID will need to have an additional character added to the end of the parcel number to be accepted in the system.
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Example of the flag error screen:

The screenshot shows a web interface with a red warning icon and the heading "REVIEW INFORMATION BELOW". Below this, there is a list of error messages:

- PLEASE REVIEW THE FOLLOWING ROWS IN YOUR DOCUMENT FOR ERRORS, THE SYSTEM HAS INDICATED PROBLEMS:
- THE NUMERIC VALUES IN THE MONTH LOCATION ARE INVALID. PLEASE CHECK PARCEL NUMBER: 0000000001- ROW(1)
- YEAR LOCATION DOES NOT MATCH CURRENT FILLING YEAR. PLEASE CHECK PARCEL NUMBER: 0000000001- ROW(1)
- PARCEL NUMBER DOES NOT EXIST - ROW(2)

Below the errors, there is a text prompt "Please select a file to load." followed by a file input field and a "Browse..." button. At the bottom left, there is an "Upload" button.

Once all flag errors have been cleared the file will upload to the system. The first view of records will show on a read only version of the records with text description allowing the user to see information correctly formatted. This page will have a print feature, so counties have a record of each document and sales from that .txt document along with values for which were uploaded into the system. This screen will show descriptive text for county, land use, municipality, reject codes, and money values will be formatted.

If any of these records need to be edited and approved, users will be directed to new screens that will give the ability to edit each record and do bulk updates.

## Contact

If you require assistance, please contact the STEB staff:

Phone:

**Main:** 717-787-5950

Email:

**Support:** [PA-TED@pa.gov](mailto:PA-TED@pa.gov)

Address:

Department of Community & Economic Development  
State Tax Equalization Board Division  
Commonwealth Keystone Building  
400 North St., 4th Floor  
Harrisburg, PA 17120



### Validation/Rejection Codes

Code	Description
00	Valid Sale
49/50	Valid Clean and Green sales
01	No Assessed Valuation
02	Family Transfer
03	Corporate Affiliations/Acquisitions or Divestments
04	Government/Public Utility
05	Charitable/Religious/Educational Institutions or other Tax Exempt Agencies
06	Financial Institutions
07	Part Interest
08	Forced/Sheriff
09	Multiple-Parcel
10	Estate Sale
11	Land Contract
12	Auction
13	Date of Transfer
14	Time on Market
15	Corporate Relocation Company
16	Sale of Doubtful Title
17	Lease Purchase/Leaseback
18	Partial Assessment
19	Equipment/Personal Property
20	Special or Preferred Assessments (i.e. Clean & Green, LERTA, KOZ, TIF, PILOT, etc.)
21	Duplicate Sale/Deed of Correction
22	Other (Needs Explanation)

**00/Valid:** meets the definition of arms-length sale, where the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by unique stimulus. Implicit in this definition is the consummation of a sale as of a specific date and the passing of title from seller to buyer under conditions whereby:

1. buyer and seller are typically motivated;
2. both parties are well informed or well advised, and acting in what they consider their best interests;
3. a reasonable time is allowed for exposure in the open market;
4. payment is made in terms of cash in United States dollars or in terms of financial

arrangements comparable thereto; and

5. the price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

(As defined by the IAAO, Standard on Ratio Studies, April 2013)

**49/50/Valid Clean and Green:** meets the definition of arms-length sale, where the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by unique stimulus.

1. The sale price must not include rollback taxes.
2. No Personal Property or personal Farm Equipment (Tractor, etc.)
3. The county must verify these sales and adjust the assessed value to indicate the full assessed value and not use the preferred assessed value amount if the county's CAMA system is not able to separate values.
4. No adjustment is made to the sale price.

**\*If the sale does not meet the criteria - invalidate using Code 20: Special/Preferred Assessments**

**Example:**

Parcel 01-001-001 123 Valley Road - Clean/Green Program sold June 1, 2017 for 175,000. This sale fits the criteria of a valid, arms-length sale, and no personal farm equipment was included in price.

Preferred AV:	50,000
AV or Market Assessed:	125,000
Sale Price:	175,000

The sale submitted should be:

Sale Price =175,000 and Assessed Value =125,000

# APPENDIX G

## Outlier Trimming Guidelines

(Source: *Standards on Ratio Studies*, Appendix B, International Association of Assessing Officers, Kansas City, Mo., 2013)

STANDARD ON RATIO STUDIES—2013

### Appendix B. Outlier Trimming Guidelines

#### B.1 Identification of Ratio Outliers

It is first necessary to determine a procedure to identify outliers. Outlier identification based on the interquartile range (IQR) uses order statistics (see table B-1) and has been shown to be robust for a wide variety of distributions (Iglewicz and Hoaglin 1993; Barnett and Lewis 1994). The term outlier is often associated with ratios that fall outside 1.5 multiplied by the IQR. A factor of 3.0 X IQR often is chosen to identify extreme outliers. Other outlier identification procedures are found in statistical literature and can be used. Outlier identification and trimming should follow the sales validation process and precede the calculation of ratio statistics and related tests or analyses.

The example in table B-1 demonstrates the use of the 1.5 X IQR procedure to identify outlier ratios. The distribution of ratios often is skewed to the right; therefore, it may be preferable to apply appropriate transformations to the ratios prior to applying the IQR method. For example, the use of logarithmic transformations tends to identify fewer high and more low ratios as outliers.

#### B.2 Scrutiny of Identified Outliers

The preferred method of handling an outlier ratio is to subject it to additional scrutiny to determine whether the sale is a non-market transaction or contains an error in fact. If an error can be corrected (for example, data entry), the property should be left in the sample. If the error cannot be corrected or inclusion of the identified outlier would reduce sample representativeness, the sale should be excluded.

#### B.3 Outlier Trimming

Once outliers have been identified and scrutinized and any errors resolved, the next step is to exclude those that may unduly influence calculated statistical measures. For this reason, it is acceptable to trim outliers identified by recognized procedures (for cautionary notes on trimming small samples, see Tomberlin [2001] and Hoaglin, Mosteller, and Tukey [1983]. An example of such trimming is found in Table B-2. However, trimming of outliers using arbitrary limits, for example, eliminating all ratios less than 50 percent or greater than 150 percent, tends to distort results and should not be employed.

Detected outliers should be reported and can be treated in a variety of ways, including trimming (D'Agostino and Stephens 1986). If outliers are to be considered for removal, the analyst can select a procedure to trim all or just the extreme or influential outliers (see table B-2). If a trimming method has been used to reject ratios from the sample, this fact must be stated in the resulting statistical

**Table B-1.** A Distribution-Free Method for Locating Outliers  
(The following procedure identifies outlier ratios that fall more than 1.5 times beyond the range of the middle 50 percent of the arrayed sample.)

Locating trim boundaries  
Data set before trimming

Rank	Ratio (A/S)
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
13	1.850
14	2.500
Median ratio	0.935
COD	32.271

Steps to locate trim boundaries

1. *Locate the first quartile point*  
Formula to locate the first quartile:  
 $(0.25 \times \text{number of ratios}) + 0.25$   
 $(0.25 \times 14 \text{ ratios}) + 0.25 = 3.75$   
3.75 is three-quarters between the third and fourth ranked ratios.  
Ratio 3 = 0.762  
Ratio 4 = 0.853  
Three-quarters between =  $(0.853 - 0.762) \times 0.75 = 0.068$   
The first quartile point =  $0.762 + 0.068 = 0.830$
2. *Locate the third quartile point*  
Formula to locate the third quartile:  
 $(0.75 \times \text{number of ratios}) + 0.75$   
 $(0.75 \times 14 \text{ ratios}) + 0.75 = 11.25$   
11.25 is one-quarter between the eleventh and twelfth ranked ratios.  
Ratio 11 = 1.178  
Ratio 12 = 1.367  
One-quarter between =  $(1.367 - 1.178) \times 0.25 = 0.047$   
The third quartile point =  $1.178 + 0.047 = 1.225$
3. *Compute the interquartile range*  
The distance between the first and third quartile = interquartile range  
 $1.225 - 0.830 = 0.395$
4. *Establish the lower boundary*  
Lower trim point = first quartile - (interquartile range  $\times$  1.5 or 3.0)  
 $0.830 - (0.395 \times 1.5) = 0.238$
5. *Establish the upper boundary*  
Upper trim point = (interquartile range  $\times$  1.5 or 3.0) + third quartile  
 $(0.395 \times 1.5) + 1.225 = 1.818$

Outliers identified:

1.850  
2.500

#### STANDARD ON RATIO STUDIES—2013

**Table B-2.** Effects of Outlier Trimming  
Outliers identified in Table B-1 trimmed

After 1.5x trimming	
Rank	Ratio (A/S)
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
Median ratio	0.917
COD	15.649

analysis. Outlier trimming is not mandatory; however, if outlier-trimming procedures are not used, sales with extreme or influential ratios must be thoroughly validated and determined to be highly trustworthy observations because they can play a pivotal role in the ratio study outcome.

#### B.4 Trimming Limitations

For some distributions, such as when the sample exhibits a high clustering around a specific ratio, the IQR outlier identification method is not appropriate. In such cases the IQR could be quite narrow, leading to the calculation of lower and upper boundaries for outliers and extremes that are quite close to the middle of the data. In such cases, ratios beyond those boundaries should not be automatically excluded, but instead reasonable judgment should be applied to exclude only true outliers or extremes. As one safeguard, analysts can refrain from automatically

deleting any “outliers” or “extremes” inside the boundaries where 95 percent (two standard deviations) of the observations would be expected to lie, assuming a normal distribution of data.

It is also appropriate to set maximum trimming limits. For small samples, no more than 10 percent (20 percent in the most extreme cases) of the ratios should be removed. For larger samples, this threshold can be lowered to 5 to 10 percent depending on the distribution of the ratios and the degree to which sales have been screened or validated. Trim limits should be developed in consideration of the extent of sales verification.

In general, IQR-based outlier identification should be undertaken in instances in which sample sizes are sufficient to preclude the aberrant results that can be expected when this procedure is applied to small, highly variable samples.

#### B.5 Analytical Use of Identified Outliers

After identification, scrutiny, and correction of errors associated with outliers, the procedure can be run again to identify any remaining apparent outliers. If outlier ratios tend to be concentrated in certain areas or other subsets of the sample, they can point directly to systematic errors in the appraisal process and should be stratified and reanalyzed if they are sufficiently representative.

#### B.6 Reporting Trimmed Outliers and Results

Ratio study reports or accompanying documentation should clearly state the basis for excluding outlier ratios. Statistics calculated from trimmed distributions, obviously, cannot be compared to those from untrimmed distributions or interpreted in the same way.



## APPENDIX H

### Planning and Conducting a Countywide Reassessment

Determining the necessity of a countywide reassessment is not only a highly technical statistical endeavor, but under Pennsylvania law it is an inherently local decision based on multifaceted local considerations. County governing body determinations about the need for and when to conduct a countywide reassessment will be based upon local factors such as assessment to sales ratio studies, property market shifts, passage of time since the last reassessment, “readiness,”<sup>1</sup> and policy and financial considerations.

The primary objective of a countywide reassessment is to achieve equitable assessments. When a county governing body chooses to conduct a countywide reassessment, consideration should be given to the planning and organization of the “type” of reassessment that is most appropriate for the county, as well as financing, contract administration and communication with various constituencies.

#### Types of Reassessment

**Turnkey.** The vendor<sup>2</sup> delivers a completed reassessment project to the county in an agreed upon timeframe. The county may consider a turnkey reassessment if the county: (1) has problems with property inventory (lack of reliable information on property characteristics) (see page 7); (2) is missing any of the readiness factors identified on pages 10-11; (3) has inadequate or inexperienced staff; or (4) has not conducted a reassessment for a number of years.<sup>3</sup> The county governing body may also consider whether it has a well-developed contract for assessment-related services (see Financing a Reassessment/Contract Administration below).

**Hybrid.** The county receives vendor assistance with limited or specifically defined aspects of the reassessment. The county may consider a hybrid reassessment if it only requires assistance with modeling. In this instance the assessment office has good sales data, property characteristics, land valuation, and well-defined neighborhoods. Again, the county governing body may also consider whether it has a well-developed contract for assessment-related services (see Financing a Reassessment/Contract Administration below).

**In-House.** The county handles all aspects of the reassessment. The county may consider an in-house reassessment if the date of last countywide reassessment is more recent and the county property inventory is manageable. The assessment office must also have adequate staff and resources, up-to-date and complete property record cards, sales data, building permits, mapping, and strong county official support.

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<sup>1</sup> See pp. 10-11.

<sup>2</sup> The qualified company that enters into an agreement with the county to provide the professional contract services described in these specifications.

<sup>3</sup> If it has been more than 15 years since the last reassessment, the contractor hired to conduct the reassessment essentially will be starting from scratch, that is, a brand new Computer-Assisted Mass Appraisal (CAMA) system will have to be created.

## Financing a Reassessment/Contract Administration

A countywide reassessment can be costly, particularly if the county does not conduct regular reassessments. The county governing body may wish to explore with the appropriate county officials and staff the potential costs and benefits of investing in a countywide reassessment. To help ensure that the reassessment is conducted appropriately and implemented successfully, the county governing body may wish to review, use or adapt the *Model RFP/Contracting Standards* developed for Pennsylvania Counties.<sup>4</sup>

## Public Information/Relations

When conducting a reassessment, clear and open communication with the public is crucial. The vendor in cooperation with the county (or the county if the reassessment is conducted in-house) should conduct a comprehensive public information program designed to coordinate all activities necessary to promote public understanding, awareness and cooperation throughout the project. Public information campaigns may be used that include media releases, informational literature and handouts, direct mailings to all or select property owners, programs for broadcast and rebroadcast on television and radio, the internet, and oral presentations. Individual presentations should be tailored to specific communities/audiences, such as:

- Property owners in various community locations.
- Businesses and professional organizations.
- Chamber of Commerce.
- Service clubs.
- County, municipal and school officials.
- Consumer groups.
- Local agricultural organizations.

Additional details about public relations/information can be found in the *Model RFP/Contracting Standards* (see Section 4.5).<sup>5</sup>

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<sup>4</sup> The Local Government Commission recommended to the County Commissioners Association of Pennsylvania that the Association adopt and implement the *Model RFP/Contracting Standards* developed by the Commission's Assessment Reform Task Force as a "best practice" and incorporate the standards into the Association's training programs. The document can be accessed on the Commission's website (<http://www.lgc.state.pa.us/>).

<sup>5</sup> *Id.*

## APPENDIX I

### Data Maintenance

Data maintenance after a countywide reassessment is a crucial process in maintaining accurate property data. An effective maintenance program bootstraps three tasks: review of building permits and subdivision plats, verification of sales, and periodic inspections of all properties.<sup>1</sup>

In Pennsylvania, every municipality or third party agency, or the Department of Labor and Industry, responsible for the issuance of building permits is required to forward a copy of each building permit to the county assessment office on or before the first day of every month.<sup>2</sup> In addition to any charge otherwise permitted by law, a municipality, a third-party agency or the Department may charge an additional fee of \$10 to each person to whom a permit is issued for administrative costs incurred in compliance with this requirement.<sup>3</sup>

If a person makes “substantial improvements” to any real property, other than painting of or normal regular repairs to a building aggregating more than \$2,500 in value, and a building permit is not required for the improvements, the property owner is required to furnish the following information to the board of assessment appeals or revision: the name and address of the person owning the property, a description of the improvements made or to be made to the property, and the dollar value of the improvements. If a person intentionally fails to comply with this provision or intentionally falsifies the information provided, the individual shall, upon conviction in a summary proceeding, be sentenced to pay a fine of not more than \$50.<sup>4,5</sup>

After receiving copies of building permits, an assessor or data collector<sup>6</sup> will visit each property and record changes to the property record card. If the construction is not yet complete, the assessor will schedule a future visit to the property. Any improvement or repair, whether or not

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<sup>1</sup> See Gloudemans, R.J., and R.R. Almy, *Fundamentals of Mass Appraisal*, International Association of Assessing Officers (IAAO), Kansas City, Mo., 2011, p. 64; *Property Assessment Valuation*, 3<sup>rd</sup> ed., IAAO, Kansas City, Mo., 2010, pp. 408-409.

<sup>2</sup> The Consolidated County Assessment Law (Title 53 of the Pennsylvania Consolidated Statutes (Pa.C.S.), Section 8801 et seq.) applies to counties of the second A through eighth class. Counties of the first and second class are governed by separate statutes.

<sup>3</sup> See 53 Pa.C.S., Section 8861 (a).

<sup>4</sup> See 53 Pa.C.S., Section 8861 (b), (c).

<sup>5</sup> Proposed legislation would amend the Consolidated County Assessment Law to further facilitate the existing statutory requirement that building permit and substantial improvement information be submitted to the county assessment office to ensure accurate property valuation and consequently, more fairly capture municipal property tax revenue. The Senate Local Government Committee amended the bill to also require that demolition permit information be submitted to the county assessment office and be subject to provisions of the bill. See Senate Bill 1006 and House Bill 1991 of the 2017-2018 session of the Pennsylvania General Assembly.

<sup>6</sup> The Local Government Commission recommended to County Commissioners Association of Pennsylvania and the Assessors’ Association of Pennsylvania that the associations adopt and implement the *Data Collector Standards* developed by the Commission’s Assessment Reform Task Force as a “best practice” and incorporate the standards into the associations’ training programs. The document can be accessed on the Commission’s website (<http://www.lgc.state.pa.us/>).

it warrants a change in assessment, must be documented on the property record to maintain accurate property characteristics. The accuracy and reliability of property record cards is crucial if future permit-related visits are necessary or when preparing for a countywide reassessment.

The IAAO recommends that properties be reinspected<sup>7</sup> at least once every four to six years to maintain a current and accurate property inventory.<sup>8</sup> Building permits will not capture every change in property characteristics, especially related to depreciation. The county assessment office may wish to implement policies and procedures delineating the time and manner for conducting these reviews, such as whether the reviews will be completed in person or drive-by-inspection. The routine inspections may also be supplemented with desktop reviews of new aerial photography, oblique imagery and/or data inventory mailers. Any changes identified by supplemental reviews must be verified by visiting the property.<sup>9</sup>

The county assessment office may also consider the use of a Sales Verification Questionnaire (See Appendix B) to validate and invalidate sales and to monitor sales.<sup>10</sup> The Community and Economic Development Enhancement Act (Act 58 of 1996) requires each county to annually prepare, certify and deliver to the State Tax Equalization Board (STEB) a list of all conveyances or other transfers of real estate.<sup>11</sup> Pennsylvania law does not require the use of a sales verification form by counties for purposes of submission of sales information to STEB. Further, counties are not required to have written procedures for sales verification methods, leading to possible inconsistencies across the Commonwealth.

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The county assessment office, in consultation with the county governing body and solicitor, may consider developing a well-documented plan/manual following a reassessment to assist in the ongoing data maintenance.

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<sup>7</sup> While it is important to maintain accurate property record information, caution should be exercised if making a change of assessment. See “Mandate of Uniformity,” pp. 2-3, and Appendix A.

<sup>8</sup> See *Property Assessment Valuation*, p. 409; *Fundamentals of Mass Appraisal*, p. 64.

<sup>9</sup> *Id.*

<sup>10</sup> The IAAO recommends the use of sales verification questionnaires and processes.

<sup>11</sup> See Section 1509.

## **APPENDIX J**

### **Education and Training**

Whether for purposes of conducting a reassessment or maintaining data after a reassessment, it is important that the county assessment office have an adequate number of trained staff and resources to perform effectively, efficiently and competently in the assessment profession.<sup>1</sup> All current and future Certified Pennsylvania Evaluators and assessment office personnel benefit from continued training related to their official position and assigned responsibilities.<sup>2</sup> The county governing body and members of the appeal boards may also wish take advantage of educational opportunities relating to assessment practices.

Key topics of training may include data collection, data entry, quality control, valuation methodologies, hardware and software development and use, sales validation, ratio studies, appeals, public relations, maintenance of data after reassessment, applicable statutes and case law. Training opportunities may be obtained from both internal and external sources, including:

- Assessors' Association of Pennsylvania
- County Commissioners Association of Pennsylvania
- International Association of Assessing Officers (IAAO)
- In-house
- Self-education
- Vendor training.

Additionally, the IAAO has undertaken an initiative to create an Apendium<sup>3</sup> that provides an overview of the expertise and skills required to effectively work within the assessment profession. The "Apendium Knowledge Areas" explore eight key topics in which assessors must establish competency.

- Working with the Legal Framework
- Collecting and Maintaining Property Data
- Developing and Managing Cadastral Data
- Appraising Property
- Leading and Managing the Assessment Office
- Managing Complaints and Appeals
- Managing Public Relations and Communications
- Oversight and Compliance Review

The chief assessor may wish to consult with the county governing body about available training opportunities and benefits.

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<sup>1</sup> International Association of Assessing Officers, Kansas City, Missouri, *Assessment Practices Self-Evaluation Guide*, 4<sup>th</sup> ed., 2013, p. 6.

<sup>2</sup> For example, office and clerical staff, cartographers/mappers, data collectors, chief assessors.

<sup>3</sup> <https://www.iaao.org/apendum/home.html> (accessed May 28, 2018).



## APPENDIX K

### Glossary<sup>1</sup>

**Ad Valorem Tax.** A tax levied in proportion to the value of the thing(s) being taxed. Exclusive of exemptions, use-value assessment provisions, and the like, property tax is an ad valorem tax.

**Appeal.** A process in which a property owner contests an assessment either informally or formally.

**Appraisal.** (1) The act of estimating the monetary value of property. (2) The monetary value of property as estimated by an appraiser. (3) Of or pertaining to appraising and related functions, for example, appraisal practice, appraisal services.

**Array.** An ordered arrangement of data, such as a listing of sales ratios in order of magnitude.

**Assessed Value.** The assessment placed on real property by a county assessment office upon which all real estate taxes shall be calculated.<sup>2</sup>

**Assessment.** Assessed value.<sup>3</sup>

**Assessment Base.** The total assessed value of all property within a designated area; the property tax base.

**Assessment Level.** The common or overall ratio of assessed values to market values.

**Assessment Progressivity (Regressivity).** An appraisal bias such that high-value properties are appraised higher (or lower) than low-value properties in relation to market values. *See also Price-Related Differential.*

**Assessor.** *See Certified Pennsylvania Evaluator.*

**Average Absolute Deviation.** *See Average Deviation.*

**Average Deviation.** The arithmetic mean of the absolute deviations of a set of numbers from a measure of central tendency, such as the median. Taking absolute values is generally understood without being stated. For example, the average deviation of the numbers 4, 6, and 10 about their median (6) is  $(2 + 0 + 4) \div 3 = 2$ . The average deviation is used in computing the coefficient of dispersion (COD).

**Base Year.** The year upon which real property market values are based for the most recent countywide revision of assessment of real property or other prior year upon which the market value of all real property of the county is based for assessment purposes. Real property market

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<sup>1</sup> *Glossary for Property Appraisal and Assessment*, 2<sup>nd</sup> ed., International Association of Assessing Officers, Kansas City, Missouri, 2013 (except where otherwise noted).

<sup>2</sup> 53 Pa.C.S., Section 8802.

<sup>3</sup> *Id.*

values shall be equalized within the county and any changes by the board shall be expressed in terms of base-year values.<sup>4</sup>

**Board.** Any of the following:

"Board" as defined in Title 53 (Municipalities Generally) of the Pennsylvania Consolidated Statutes (Pa.C.S.), Section 8802 (relating to definitions).

The Board of Property Assessment, Appeals and Review in a county of the second class under the act of June 21, 1939 (P.L. 626, No. 294), referred to as the Second Class County Assessment Law, or a similar body established by a home rule county.

The Board of Revision of Taxes and Appeals under Title 11 (Cities) of the Pa.C.S. Chapter 125, Subchapter A.

The Board of Revision of Taxes in a county of the first class under the act of June 27, 1939, (P.L. 1199, No. 404), relating to taxation.

**Calibration.** The process of estimating the coefficients in a mass appraisal model.

**Central Tendency, Measure of.** A single point in a range of observations around which the observations tend to cluster. The three most commonly used measures of central tendency are the mean, median and mode.

**Certified Pennsylvania Evaluator (CPE).** A person responsible for the valuation of real property for ad valorem taxation purposes who has satisfied the qualifications for certification as a Certified Pennsylvania Evaluator pursuant to the Assessors Certification Act and the Professional and Vocational Standards under Title 49 of the Pennsylvania Code, Chapter 36, Subchapter C (Certified Pennsylvania Evaluators).

**Coefficient of Dispersion (COD).** The average deviation of a group of numbers from the median expressed as a percentage of the median. In ratio studies, the average percentage deviation from the median ratio.<sup>5</sup>

**Coefficient of Price-Related Bias (PRB).** An index of price-related bias obtained by regressing percentage deviations from the median ratio on percentage changes in a value proxy, which is obtained by giving equal weight to assessments and sales prices so as to minimize measurement biases.

**Coefficient of Variation (COV).** A standard statistical measure of the relative dispersion of the sample data about the mean of the data; the standard deviation expressed as a percentage of the mean.

**Common Level Ratio (CLR).** The ratio of assessed value to current market value used generally in the county and published by the State Tax Equalization Board on or before July 1 of the year

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<sup>4</sup> 53 Pa.C.S., Section 8802.

<sup>5</sup> *Standard on Ratio Studies*, International Association of Assessing Officers (IAAO), Kansas City, Mo., April 2013.



prior to the tax year on appeal before the board under the act of June 27, 1947 (P.L. 1046, No. 447), referred to as the State Tax Equalization Board Law.<sup>6</sup>

**Computer-Assisted Mass Appraisal (CAMA).** A process that uses a system of integrated components and software tools necessary to support the appraisal of a universe of properties through the use of mathematical models that represent the relationship between property value and supply/demand factors.<sup>7</sup>

**Confidence Interval.** A range of values calculated from the sample observations that are believed, with a particular probability, to contain the true population parameter (mean, median, COD). The confidence interval is not a measure of precision for the sample statistic or point estimate, but a measure of the precision of the sampling process. See **Reliability**.

**Confidence Level.** The required degree of confidence in a statistical test or confidence interval; commonly 90, 95, or 99 percent. A 95 percent confidence interval would mean, for example, that one can be 95 percent confident that the population measure (such as the median or mean appraisal ratio) falls in the indicated range.

**Countywide Revision of Assessment.** A change in the established predetermined ratio or revaluation of all real property within a county.<sup>8</sup>

**Database Management System (DBMS).** System software for creating and managing databases. The DBMS provides users and programmers with a systematic way to create, retrieve, update and manage data.

**Data Collector.** An individual employed by a county or vendor for the sole purpose of collecting real property characteristics.

**Dispersion.** The degree to which data are distributed either tightly or loosely around a measure of central tendency. Measures of dispersion include the average deviation, coefficient of dispersion, coefficient of variation, range and standard deviation.

**Economic Area.** A geographic area, typically encompassing a group of neighborhoods, defined on the basis that the properties within its boundaries are more or less equally subject to a set of one or more economic forces that largely determine the value of the properties in question.

**Effective Age.** The typical age of a structure equivalent to the one in question with respect to its utility and condition as of the appraisal date. Knowing the effective age of an old, rehabilitated structure or a building with substantial deferred maintenance is generally more important in establishing value than knowing the chronological age.

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<sup>6</sup> 53 Pa.C.S., Section 8802.

<sup>7</sup> *Standard on Ratio Studies*.

<sup>8</sup> 53 Pa.C.S., Section 8802.

**Established Predetermined Ratio (EPR).** The ratio of assessed value to market value established by the board of county commissioners or comparable governing body in a home rule county and uniformly applied in determining assessed value in any year.<sup>9</sup>

**Field Reviewer.** A CPE with experience and knowledge of valuation techniques employed on a project for the property categories for which the CPE will be responsible. A field reviewer will review accuracy of data collected for property in a previously identified neighborhood and preliminary and/or final values.

**Frequency Distribution.** A table showing the number or percentage of observations falling within the boundaries of a given set of classes. Used in ratio studies to summarize the distribution of the individual ratios.

**Geographic Information System (GIS).** (1) A database management system used to store, retrieve, manipulate, analyze and display spatial information. (2) One type of computerized mapping system capable of integrating spatial data (land information) and attribute data among different layers on a base map.

**Governing Body.** The county board of commissioners or the body vested with the legislative authority of the county in counties which have adopted a home rule charter or an optional plan.

**Histogram.** A bar chart or graph of a frequency distribution in which the frequencies of the various classes are indicated by horizontal or vertical bars whose lengths are proportional to the number or percentage of observations in each class.

**Horizontal Inequity.** Differences based on criteria other than value range in the levels of assessment of groups of properties. For example, properties in one neighborhood may have a higher level of assessment than similar properties in another neighborhood.

**International Association of Assessing Officers (IAAO).** A professional membership organization of government assessment officials and others interested in the administration of the property tax.

**Level of Assessment; Assessment Ratio.** The common or overall ratio of assessed values to market values.

**Market Area.** A geographic area, typically encompassing a group of neighborhoods, defined on the basis that the properties within its boundaries are subject to similar economic forces and supply and demand factors. A separate valuation model is often developed for each market area. Smaller or mid-sized jurisdictions may constitute a single market area.

**Market Value.** The price in a competitive market a purchaser, willing but not obligated to buy, would pay an owner, willing but not obligated to sell, taking into consideration all the legal uses to which the property can be adapted and might be reasonably applied. (*See Buhl Found. v. Board of Prop. Assessment*, 180 A.2d 900 (Pa. 1962).

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<sup>9</sup> 53 Pa.C.S., Section 8802.

**Mean.** A measure of central tendency. The result of adding all the values of a variable and dividing by the number of values. For example, the mean of 3, 5, and 10 is 18 divided by 3, or 6. Also called arithmetic mean.

**Median.** A measure of central tendency. The value of the middle item in an uneven number of items arranged or arrayed according to size; the arithmetic average of the two central items in an even number of items similarly arranged; a positional average that is not affected by the size of extreme values.

**Mode.** A measure of central tendency. (1) In an array of the values of a variable, the most frequently occurring value. (2) By extension for grouped data, the class with the greatest number of observations.

**Neighborhood.** (1) The environment of a subject property that has a direct and immediate effect on value. (2) A geographic area (in which there are typically fewer than several thousand properties) defined for some useful purpose, such as to ensure for later multiple regression modeling that the properties are homogeneous and share important locational characteristics.

**Outliers.** Observations that have unusual values, that is, they differ markedly from a measure of central tendency. Some outliers occur naturally; others are due to data errors.

**Pennsylvania Consolidated Statutes (Pa.C.S.).** The official statutory codification established by the General Assembly under the act of November 25, 1970 (P.L. 707, No. 230).<sup>10</sup>

**Point Estimate.** A single numerical value that can be used to estimate a population parameter. It is calculated on the basis of information collected from a sample. Point estimates are generally constructed to provide the best unbiased estimate of the population parameter consistent with the sample data. However, the point estimate is only an estimate, and is unlikely to have the same value as the population parameter. (See **Confidence Interval** and **Reliability** for discussion of precision of the sampling process.)

**Polygon.** A line chart.

**PRB.** See **Coefficient of Price-related Bias**.

**Price-Related Differential (PRD).** The mean divided by the weighted mean. The statistic has a slight bias upward. Price-related differentials above 1.03 tend to indicate assessment regressivity; price-related differentials below 0.98 tend to indicate assessment progressivity.<sup>11</sup>

**Progressivity.** When low-value properties are appraised at smaller percentages of market value than high-value properties, assessment progressivity is the result.<sup>12</sup>

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<sup>10</sup> "Statutes of Pennsylvania and the Constitution of Pennsylvania," Pennsylvania General Assembly, <http://www.legis.state.pa.us/cfdocs/legis/li/public/> (accessed June 8, 2018).

<sup>11</sup> *Standard on Ratio Studies*.

<sup>12</sup> *Id.*

**Property Record Card including ‘ecard’.** A document, hard paper copy or electronic, detailing basic real property information and property improvement characteristics.

**Ratio Study.** A study of the relationship between assessed values and market values. Indicators of market values may be either sales (sales ratio study) or independent “expert” appraisals (appraisal ratio study).<sup>13</sup>

**Reassessment.** The revaluation of all real property within a county. Also called a revaluation or reappraisal.

**Regressivity.** When low-value properties are appraised at greater percentages of market value than high-value properties, assessment regressivity is indicated.<sup>14</sup>

**Reliability.** In a sampling process, the extent to which the process yields consistent population estimates. Ratio studies typically are based on samples. Statistics derived from these samples may be more or less likely to reflect the true condition in the population depending on the reliability of the sample. Representativeness, sample size and sample uniformity all contribute to reliability. Formally, reliability is measured by sampling error or the width of the confidence interval at a specific confidence level relative to the central tendency measure.

**Scatter Diagram or Scatterplot.** A graphic means of depicting the relationship or correlation between two variables by plotting one variable on the horizontal axis and one variable on the vertical axis. Often in ratio studies it is informative to determine how ratios are related to other variables. A variable of interest is plotted on the horizontal axis, and ratios are plotted on the vertical axis.

**Stratification.** The division of a sample of observations into two or more subsets according to some criterion or set of criteria. Such a division may be made to analyze disparate property types, locations or characteristics, for example.

**Tax Base, Property.** The total of all the assessed values in a given community.

**Uniformity.** The equality of the burden of taxation in the method of assessment.

**Uniform Standards of Professional Appraisal Practice (USPAP).** The purpose of USPAP is to promote and maintain a high level of public trust in appraisal practice by establishing requirements for appraisers. It is essential that appraisers develop and communicate their analysis, opinions and conclusions to intended users of their services in a manner that is meaningful and not misleading. The Appraisal Standards Board (ASB) promulgates USPAP for both appraisers and users of appraisal services. The ASB is a board established by The Appraisal Foundation, authorized by Congress as the source of appraisal standards and appraiser qualifications.

**Valuation.** Developing and reviewing a new determination of market value for each parcel, based on current data for the County’s identified base year of valuation by the appropriate use of one or more of the accepted three approaches to value (cost, market and income).

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<sup>13</sup> *Standard on Ratio Studies.*

<sup>14</sup> *Id.*

**Vertical Inequity.** Differences in the levels of assessment of properties related to the value ranges of the properties. That is, properties of higher value have assessment levels different from properties of lower value.

**Weighted Mean Ratio.** Sum of the appraised values divided by the sum of the sale prices (or independent estimates of market value), which weights each ratio in proportion to the sale price (or independent estimate of market value).

**Zoning.** The exercise of the police power to restrict land owners as to the use of their land and/or the type, size and location of structures to be erected thereon.

